Precision Drive Systems

maxon

Product Range 2020/21

Sold & Serviced By:

ELECTROMATE

Toll Free Phone (877) SERV098

www.electromate.com

sales@electromate.com

maxon selection guide

Get an overview of the extensive range of DC brushed and brushless motors, drives, encoders, control electronics, and the variety of possible combinations. Make a preliminary selection based on the power and size, commutation, or bearings. Quickly find what you're looking for, including sterilizable drives for use under special ambient conditions or drives with integrated electronics.

Accessories overview

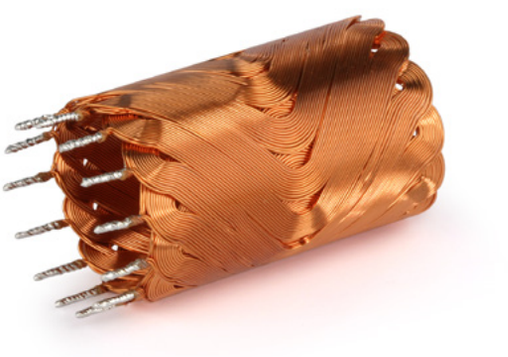
Easily find the accessories you need for connecting maxon DC motors to maxon controllers.

We are maxon

We develop and build high precision electric drive systems that are among the best in the world.

We combine brushed and brushless DC motors, gearheads, sensors, and controllers into complete mechatronic drive systems – from customized single units to mass production.

Since 1961, businesses from a wide range of industries including medical technology, robotics, industrial automation, mobility, and aerospace place their trust in reliable drive systems by maxon. Our drives are perfectly suited for wherever extreme precision and the highest quality standards are needed and where compromises cannot be tolerated – on Earth and on Mars.



System solutions from a single source.

Dear Valued Customers

Over the last 60 years, maxon has grown to be the global leading provider of drive system solutions. We dedicate a significant amount of resources into the design and development of the latest drive technologies.

In order for us to continually improve and offer new solutions we rely on your feedback, so thank you to our customers for your continued support and trust in maxon. As we continue to improve upon the best service you are accustomed to, we've added more experts to our specialized business units of Medical, Aerospace, Industrial Automation and Mobility Solutions. Working together we can find the right drive solution – from a standard product to a custom-made solution.

Our latest catalog features a new designed and a simplified layout to help you find the information you are searching for quickly and easily. Throughout the catalog, we provide an overview of our DC motors, gearheads, encoders and controllers. You will also find expert technical articles and the useful maxon selection guide.

There are many new products to discover. In this catalog, you will find the modular IDX compact drive, which consists of a powerful EC-i motor and an EPOS4 positioning controller. This drive was developed especially for applications in industrial and logistics automation. We also added positioning controllers that are also available in a micro version, which is ideal for robotic applications in tight spaces.

We hope this catalog will be of great help to you in your search for the perfect drive solution. Of course all information is also available online, at **shop.maxongroup.com.** Should you need additional assistance in selecting the perfect drive solution, our team of experts is available worldwide to help answer your questions.

We thank you for your continued business and hope you enjoy browsing our new catalog.

"Working together with focus and flexibility, we find the right answer – from standard product to custom-made solution."

Eugen Elmiger, CEO maxon Group

maxon


maxon DC motor
148866
swiss made
W 06
maxon DC motor
261039
swiss made
maxon DCX
swiss made
maxon DCX
swiss made
maxon A-max
990116
swiss made
maxon DC-max
swiss made
maxon GPX
made in germany
maxon ECX
swiss made
maxon EC
449464
assembled
Y980066
X4 Hall Sensor
X5 Encoder
EPOS4

Close to 100 %

We have a portfolio of drives for any application, and DC motors with an efficiency of more than 90 %

Maximum power packed into tiny spaces. maxon drives feature the following:

- → High acceleration
- → Long service life
- → Low power consumption
- → Unsurpassed reliability
- → Able to bear high overloads for short periods
- → Excellent control properties

One stop shop

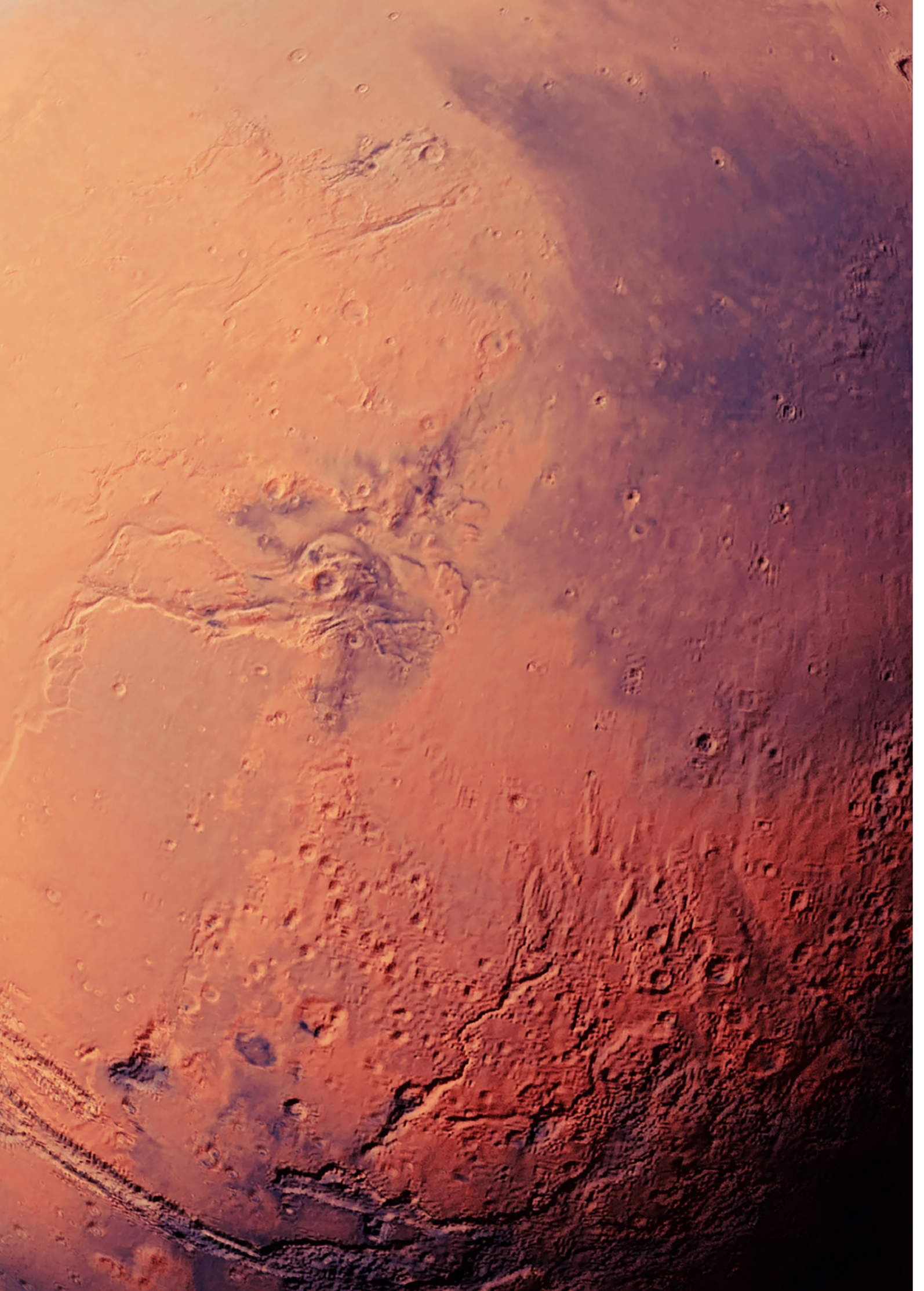
DC and BLDC motors
Brushed and brushless DC motors.
Diameter 4 to 90 mm.

Gearheads and screw drives
Planetary, spur and special gearheads. Compact screw drives with steel and ceramic screws.

Sensors
Magnetic, optical, and inductive encoders, DC tachometers and resolvers.

Controllers
4-Q PWM servo controllers, 1-Q EC amplifiers, positioning controllers, and multi-axis motion controllers.

Ceramic components
Custom ceramic components and standard components such as ceramic axles, shafts, or screws.



Our drive systems go a long way

Change the world with a partner you can rely on

At maxon, we believe that outstanding engineers and technicians can make a positive impact on the world. This is why we support them in their efforts to go off the beaten path and provide the perfect drive system for their ideas.

Medical

Drive systems for medical technology

maxon drives are used in numerous medical applications. Our motors provide reliable, high-quality performance in high-precision devices such as active implants, insulin pumps, surgical robots, power tools, and hand and foot prostheses. Drive components for medical technology applications must meet extremely demanding requirements such as: precision, sterilizability, smooth running and long service life, as well as low heat build-up in DC brushed and brushless drives.

The maxon medical business unit specializes in developing and producing drive systems for a variety of medical applications. Our engineers are well versed in the technical requirements of the medical industry, whether for active implants or robot-assisted rehabilitation.

Active implants

- → Cardiac support systems
- → Active valves
- → Positioning systems
- → Pump systems

Surgical systems

- → Surgical robots
- → Power tools
- → Dental devices

Pumps and medication delivery systems

- → Insulin / pain pumps
- → Dialysis pumps

Rehabilitation and prosthetics

- → Hand prostheses
- → Foot prostheses
- → Exoskeletons
- → Therapy systems

Aerospace

Drive systems for the aerospace industry

For more than 20 years, drive technology by maxon has been making the Mars rovers on the Red Planet mobile. These days, every modern long-haul airliner has several hundred drive systems on board. Back here on the ground, maxon and its customers develop drive solutions consisting of individual components or sophisticated technical systems for passenger aircraft, helicopters, spacecraft and even unmanned aerial vehicles. maxon guarantees the unrivaled quality of its efficient, reliable and powerful drive systems for the aerospace industry.

Aviation

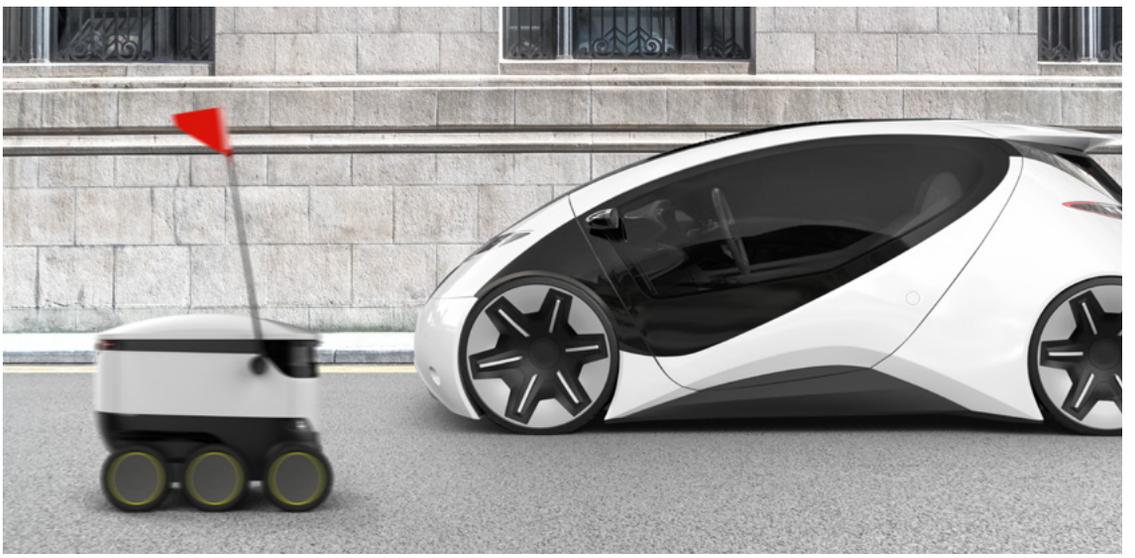
- **Aircraft control systems:** actuators for small control surfaces, emergency fuel shut-off valve, fly-by-wire control systems, flaps, and air-conditioning systems
- **On-board communication and cabin equipment:** actuators for antennas, window shade systems, power seat adjustment, toilet flushing, and locking devices for overhead baggage compartments

Space

- Valve drives for rocket engines, solar array drive and deployment mechanisms, and launch/abort or separation mechanisms
- Mission-specific mechanisms for research spacecraft and robotic probes

Unmanned aerial vehicles

- **Observation:** inspection, agriculture, mapping and delivery drones
- **Payload mechanisms:** control surface actuators, electro-optics, LiDAR and winch mechanisms
- Drive systems consisting of an optimized combination of motor, controller and propeller for multirotor, fixed-wing and unmanned VTOL aircraft



Mobility solutions

Drive systems for mobility, logistics and robotics applications

Electric drive systems have a major impact on our everyday life and mobility. Thirty years ago, it was unimaginable that an autonomous delivery robot would bring a pizza or package to our front door. More and more people are using e-bikes or electric scooters for commuting and recreation. Whether on the road, on the race track, in the logistics center or underwater, — maxon mechatronics systems set you in motion reliably and safely. Our systems consist of motors, gearheads, sensors, batteries and controllers and constitute the basic building blocks for complex applications. Our mobile apps include cloud connectivity and give our customers access to a range of functions, including retrieval of current driving data or positions, customization of parameters, or fleet management. — All components are verified by our specialists and then perfectly matched to each other. This allows us to offer a system solution from a single source.

Automotive

- → SCR systems (exhaust gas treatment for diesel vehicles)
- → Dynamic suspension control (passenger cars)
- → LiDAR systems (remote sensing technology for autonomous vehicles)

E-mobility

- → E-bike systems with customized maxon BIKEDRIVE solutions
- → Electric scooters and trikes
- → Electric wheelchairs and rehabilitation vehicles

Logistics and robotics

- → Logistics shuttles
- → Mobile and autonomous logistics robots (AGVs)
- → Farm robots
- → Multi-axis lightweight robots
- → Collaborative robots

Maritime applications

- → Remotely operated underwater vehicles (ROVs)
- → Autonomous underwater vehicles (AUVs)

Lab automation

- Liquid handling (pipetting robots)
- Point of care diagnostics (POC)
- DNA sequencing
- PCR analysis

Power tools

- Strapping tools, battery-powered staplers
- Pruning shears, plant tying machines, saws, harvester implements
- Electric screwdrivers, nail guns, pressing tools

Oil and gas industry

- Measurement while drilling (MWD)
- Measurement and inspection systems
- Valve controllers
- Hydraulic pump systems

Semiconductor industry

- Wafer production
- Semiconductor finishing
- Pick-and-place applications
- Analysis and test systems for product testing

Test and measurement technology

- 3D measuring devices
- LiDAR systems
- Surface testing devices
- Scanner
- Total stations
- Precision scales

Safety systems

- Safety doors
- Locking systems
- Mobile inspection systems
- Surveillance cameras

Industrial automation

Drive systems for industrial automation

Industry 4.0, the Internet of Things and artificial intelligence are affecting manufacturing processes at every company, including maxon, where industrial production is being redefined. We are constantly raising our standards of quality, efficiency and flexibility to a new level. This is essential because complex mechatronic systems only work if components are of the highest quality and perfectly matched to each other.

maxon is one of the only suppliers in the world that develops and manufactures DC motors, gearheads, sensors and controllers itself. Our customers benefit from this in many ways, for example in the manufacturing of drive systems for lab automation, the oil and gas industry, test and measurement technology or semiconductor production. All these applications require the highest accuracy, sustainability, reliability and quality. Our interdisciplinary engineering team works closely with customers to develop the perfect, tailor-made solution for customer-specific applications. From simple modifications to completely new designs, maxon offers everything from a single source.

maxon X drives

Configure your drive online – according to your individual needs

Mechanical and electrical data, dimensional drawings and CAD files can be downloaded immediately after the configuration has been completed. Within 11 working days, your drive will be ready for shipment.

xdrives.maxongroup.com

Brushed DC motors

maxon DCX

Powerful
Up to 120 W continuous output power, robust and very quiet.

Highly dynamic
Ironless winding and the latest magnetic material.

Efficient
Efficiency of more than 90%.

maxon DC-max

Cost-effective
Unrivaled price-performance ratio.

Dynamic
Ironless winding and the latest magnetic material.

Efficient
Efficiency of almost 90%.

Brushless DC motors

maxon ECX

High speed
Up to 120 000 rpm, smooth-running, almost no heat development.

Efficient
Efficiency of more than 90%.

Large selection
Various power stage options and diameters, electrical and mechanical interfaces.

Sterilizable
Sterilizable for up to 2000 cycles.

Produced within 11 days

Lean, automated processes ensure that all drive versions are ready for shipment within 11 days

Assemble your individual brushed or brushless DC drive: You can configure the gear stages, the motor bearings, the shafts, the encoder and much more. Design your custom drive online today and your finished drive will ship from Switzerland in 11 working days.

Planetary gearhead

maxon GPX

Modular
High number of variants for different applications.

High power density
Transmission of high torques and speeds.

High efficiency
Up to 96%.

Sterilizable
Sterilizable for up to 2000 cycles.

Encoder

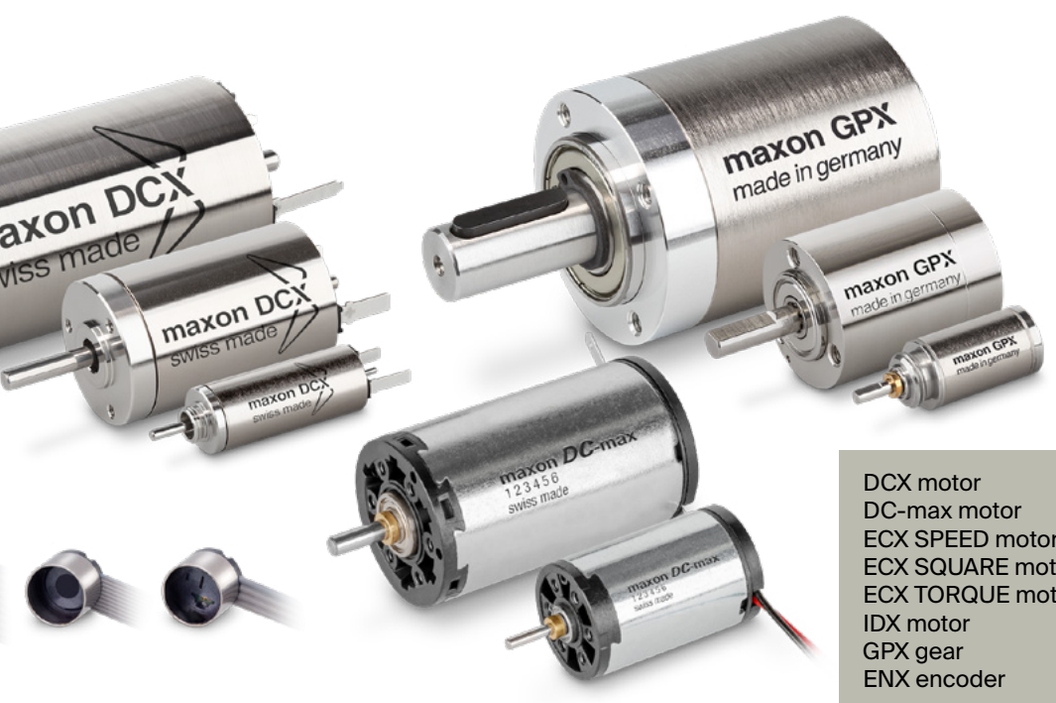
maxon ENX

Robust and compact
Interference-free functionality in a robust housing that takes up minimal space.

Variety of options
Various 3-channel incremental and absolute encoders.

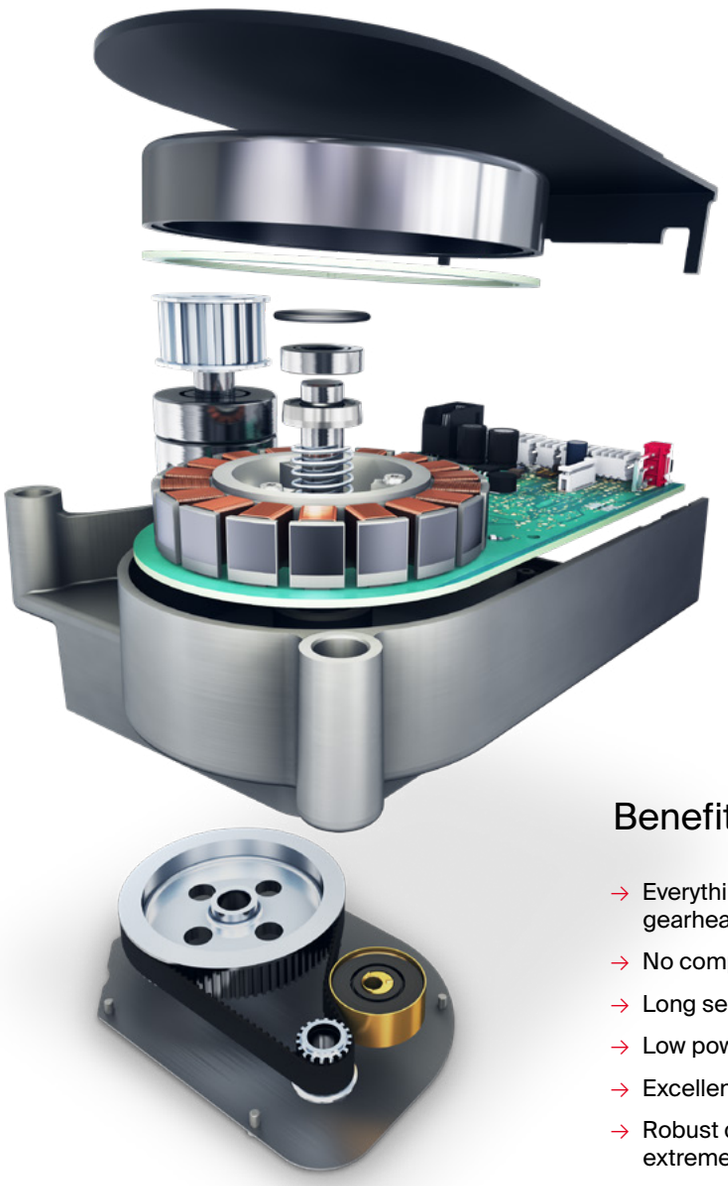
Flexible
Selectable counts per turn, signal protocol and electrical connection.

Sterilizable
Sterilizable for up to 1000 cycles.



Ready for the next step

We develop customized mechatronic drive systems
Premium quality from a single source



Benefits

- → Everything from a single source: DC/BLDC motor, gearhead, sensor, electronics, software, housing
- → No compromise on quality
- → Long service life
- → Low power consumption
- → Excellent control properties
- → Robust design: resistant to vibrations, shocks, and extreme temperatures
- → Compact design: top volume-to-performance ratio

The invisible door opener

Together with a Swiss elevator manufacturer, maxon developed a system solution for driving elevator doors. Encased in a housing, the door drive can be mounted directly to the lift cab. And this is where its real work starts. There are many different types of elevators, with differently sized cabs, different materials and, depending on the country, different safety standards. After a homing procedure, the controller co-developed by maxon detects the size and weight of the doors, autonomously calculates the optimal parameters, and corrects them if necessary. In just a few steps, the door drive is configured and ready for use. The system solution combines a brushless EC90 flat with customized housing, an integrated EPOS positioning controller and MILE encoder.

Complex mechatronic drive systems only work if all components are of the highest quality and perfectly synchronized

maxon not only develaops and produces DC and BLDC motors, gearheads, sensors, and controllers, but is also able to combine the high-quality drive components in a mechatronic system. The benefits: a compact design, components configured specifically for the customer, and the guarantee of obtaining maximum performance from the drive system.

Better quality of life

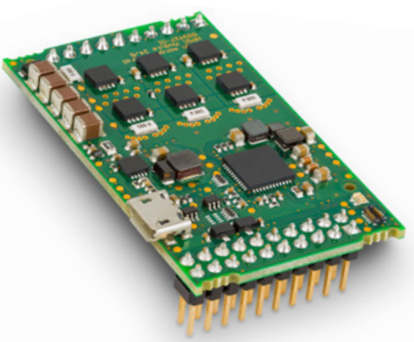
Exoskeletons are used in medicine and industry. The mechatronic support structures help in cases of paralysis, for example, or with post-accident rehabilitation. The system solution from maxon consists of a powerful, brushless flat motor with an encoder, a three-stage planetary gearhead and an EPOS4 controller. The components are stored in a light yet robust aluminum housing, with not a millimeter of space wasted. The Exoskeleton Drive from maxon is mainly suitable for knee and hip joints.

For clean air

The drive system consists of a customized brushless flat motor plus electronics. This system solution accurately regulates the urea supply for treatment of diesel exhaust gas, which triggers a chemical reaction that breaks down toxic nitrogen compounds. This pollutant separation ensures compliance with the latest exhaust gas standards. The system is primarily used in trucks and is an important contribution from maxon to improve the global climate.

What does maxon mean by "mechatronic drive systems"?

maxon has extensive knowledge of the perfect interaction of various drive components – and thus of mechatronic drive systems. After all, we've been developing and producing drive components that are among the best in the world for decades now. These include precision motors, gearheads, sensors, and controllers. As system experts, we are your first choice when you need to find sophisticated solutions to complex drive problems and implement these in your application.

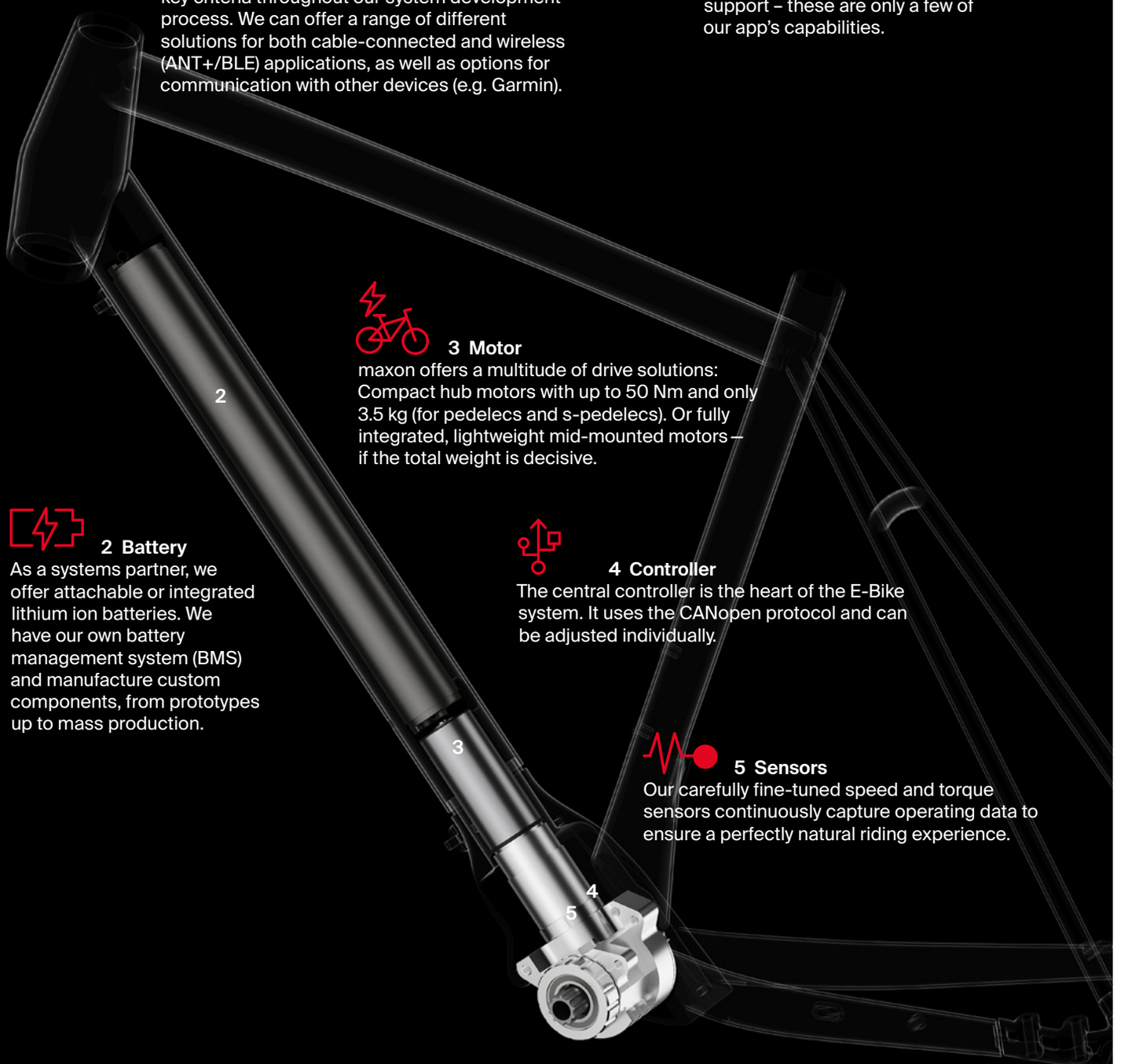


Precise medical technology

Precision, speed, and user friendliness are indispensable requirements of medical hand-held devices. This sterilizable drive unit from maxon consists of a brushless motor with robust stainless steel housing and cable connection. The motor is controlled by a separate control unit. This is where HPSC (high precision sensorless control) is used, an extremely sophisticated method developed by maxon for the sensorless commutation of brushless motors. During the development of this drive system for dental medicine, particular attention was also paid to its ergonomic properties, so that the hand tool is comfortable to hold. It is available in a range of sizes and power levels.

We build your E-Bike system

We offer our customers a large number of e-mobility solutions.
From individual components to complete systems.



1 HMI & Display
Intuitive HMIs and smart display solutions are key criteria throughout our system development process. We can offer a range of different solutions for both cable-connected and wireless (ANT+/BLE) applications, as well as options for communication with other devices (e.g. Garmin).

Cloud Service & App
Collect ride data, adjust personal settings, navigate, or request support – these are only a few of our app's capabilities.

3 Motor
maxon offers a multitude of drive solutions: Compact hub motors with up to 50 Nm and only 3.5 kg (for pedelecs and s-pedelecs). Or fully integrated, lightweight mid-mounted motors – if the total weight is decisive.

2 Battery
As a systems partner, we offer attachable or integrated lithium ion batteries. We have our own battery management system (BMS) and manufacture custom components, from prototypes up to mass production.

4 Controller
The central controller is the heart of the E-Bike system. It uses the CANopen protocol and can be adjusted individually.

5 Sensors
Our carefully fine-tuned speed and torque sensors continuously capture operating data to ensure a perfectly natural riding experience.

swiss made
maxonbikedrive.com

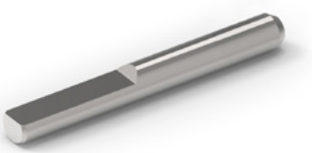
Modify

The online configurator

With our configurator, you can easily modify your drive online as you need it. It allows you to adapt a shaft, flange, bearing, or electrical connection perfectly to your application. With our automated processes, you will be holding your customized drives in your hands within a few days: **xdrives.maxongroup.com**

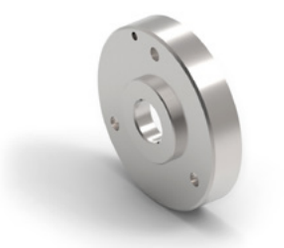
If you need further adjustments to your drives, such as hollow shafts, special lubricants, or special windings, please contact us for assistance.

Shaft
Length
Diameter
Surface
Cross bore



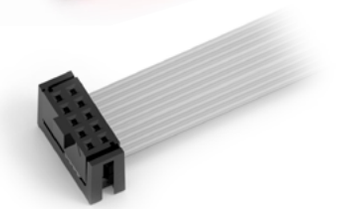
Bearings
Ball bearing
Sleeve bearing
Lubrication

Flange
Centering collar
Bolt circle
Thread



Winding
Nominal voltage
Temperature range

Electrical connection
Terminals or cables
Cable length
Connection alignment
Connector



Output component
Pinion
Pulley

Notes on the catalog.

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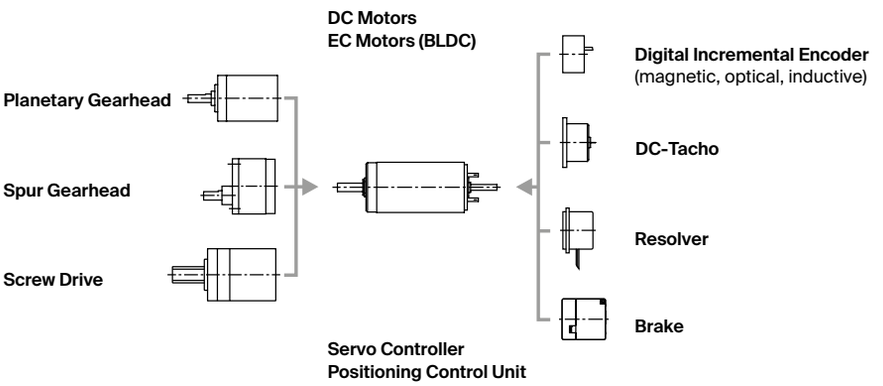
Combine

The maxon modular system

The motors, gearheads, sensors, brakes, and controllers of maxon motor are perfectly matched to each other and can be combined in a number of ways. Our modular system makes it easy to find suitable components for your motor – in the catalog and in the online shop. **shop.maxongroup.com**



Great choice, easy ordering

The diversity of motors and product combinations offered by maxon is unmatched worldwide. The maxon modular system and the numerous options for windings offer even more possibilities for variation. To make the delivery times as short as possible for our customers, we organized our products into program groups.

Stock program
The market-oriented selection from our extensive product portfolio offers you short delivery times.

Standard program
In the comprehensive standard program, products are included which can be produced and delivered in a short time. The plenitude of versions in this program offer tried and tested standard products for optimized application.

Special program
A wide range of motors and combinations is available on request.

We are engineers. Dedicated to the development of drive technology.

Quality with no compromise.

Development engineers and designers at maxon motor use only state-of-the-art calculation and configuration software. This enables us to develop customer-specific solutions quickly. Advanced qualification and risk assessment methods guarantee that all of our products are highly reliable and robust. Simultaneously, systematic process and product optimization programs enable us to provide our customers with more options for drive configuration – in shorter delivery times. An example are maxon DCX drives, which can be configured online.

Consistent standards on quality, safety, and procedures ensure that only premium products leave our factories. The business and production processes fulfill international standards such as ISO 9001 and ISO 14001. maxon medical has ISO 13485 certification and products for the aero-space industry have ISO 9100 certification.

We are experts in precision drives.

Flexible in-house production.

All important components found in our maxon motor drive systems are produced on machines and manufacturing lines developed in-house. Our customers are guaranteed efficient and fast manufacturing of their products, whether in small or in large quantities, as well as maximum flexibility to meet special needs and requirements.

Our core areas of expertise include:

- Winding technology
- Standard and special gearhead engineering
- Encoder technology
- Electronics and systems technology
- Injection molding processes for plastics as well as ceramic and metal powder (CIM/MIM)
- Installation and automation technology
- Development / project management
- Quality management

SN EN ISO 9001

SN EN ISO 9001 specifies the requirements to a quality management system (process approach) that an organization have to meet in order to provide products and services that meet the customer expectations as well as comply with the applicable regulatory requirements. Simultaneously, the management system has to be subject to continuous improvement.

SN EN ISO 14001

Is an internationally accepted quality norm for environmental management systems (EMS). It covers environmental-relevant processes and procedures in a company, requiring a company's management and employees to adopt environmentally-compatible behavior and constantly seek to improve its procedures and documentation.

EN 9100

This is an internationally accepted quality standard of the aerospace industry. It obliges companies and employees to reduce potential risks in the aerospace industry to a minimum by structuring the design and manufacturing processes accordingly. At maxon motor, this standard is applied for customer-specific products on request – except for A-max motors and controllers.

SN EN ISO 13485

Is an internationally accepted quality norm for medical products that requires management and staff to ensure that the design and manufacture of medical products minimize potential risks for patients. The traceability of processes and raw materials must also be guaranteed. At maxon, this standard is applied for customer-specific products on request (≤ ∅10 mm drives).

Overview of the maxon certifications.

	maxon Sachseln	**maxon Sexau**	**maxon Hungary**	**maxon Korea**
ISO 9001	■	■	■	■
ISO 14001	■	■	■	■
EN 9100	■	■		
ISO 13485	■			

Quality management

Only performance counts

Drives manufactured by maxon motor can be absolutely relied on even under the most difficult conditions – they have for example been in use on Mars for years. But maxon DC motors do not only do their job in space, they also function in tough conditions on and deep below the surface of the Earth flawlessly and efficiently.

The quality management system of maxon motor is an integral part of the overall management system. The operational and organizational structures, the powers and responsibilities, as well as the process and procedure assessments are documented for all employees. The quality management system is enacted, maintained and periodically verified.

EU Directives

maxon products are designed for installation in complete devices and are considered incomplete machines according to EU Directive 2006/42/EC (Machinery Directive). They are designed to be installed in machines or other incomplete machines and are therefore not CE marked. It is the responsibility of the end device manufacturer to identify the relevant directives and issue a declaration of conformity.

maxon confirms compliance with the following directives of the European Union. Exceptions are described on the respective product pages.

1907/2006/EU REACH
2012/19/EU WEEE
2018/891/EU Waste Framework Directive
2011/65/EU RoHS

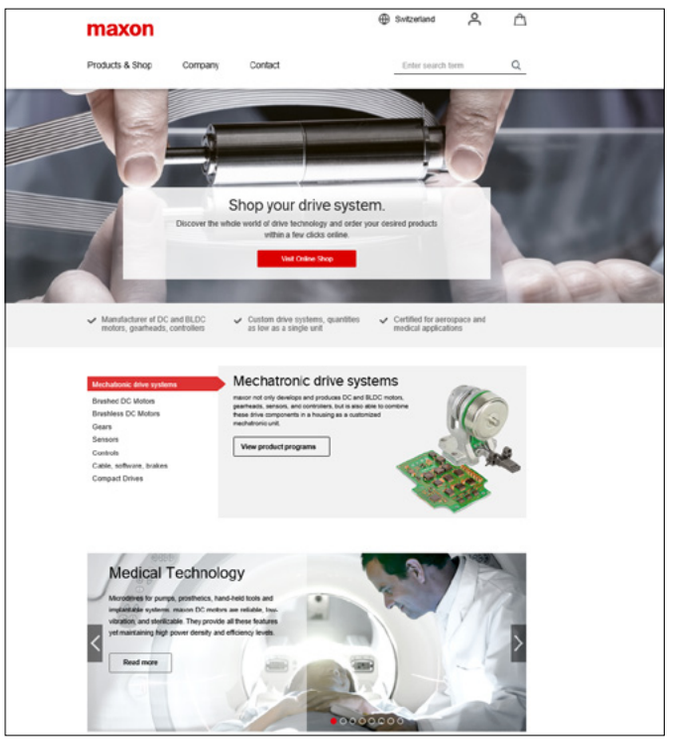
UL and CSA

Certain applications and markets require UL- or CSA-certified motors and drives. maxon's standard catalog products do not have such certification. However, we are able to certify our motors and drives in accordance with UL or CSA standards. Please contact your local maxon partner for more information.

www.maxongroup.com

Visit us online and discover the digital maxon world

On our website, you can find general news and information on our products and services, as well as an integrated online shop, the selection program and the maxon online configurator.



maxon online configurator

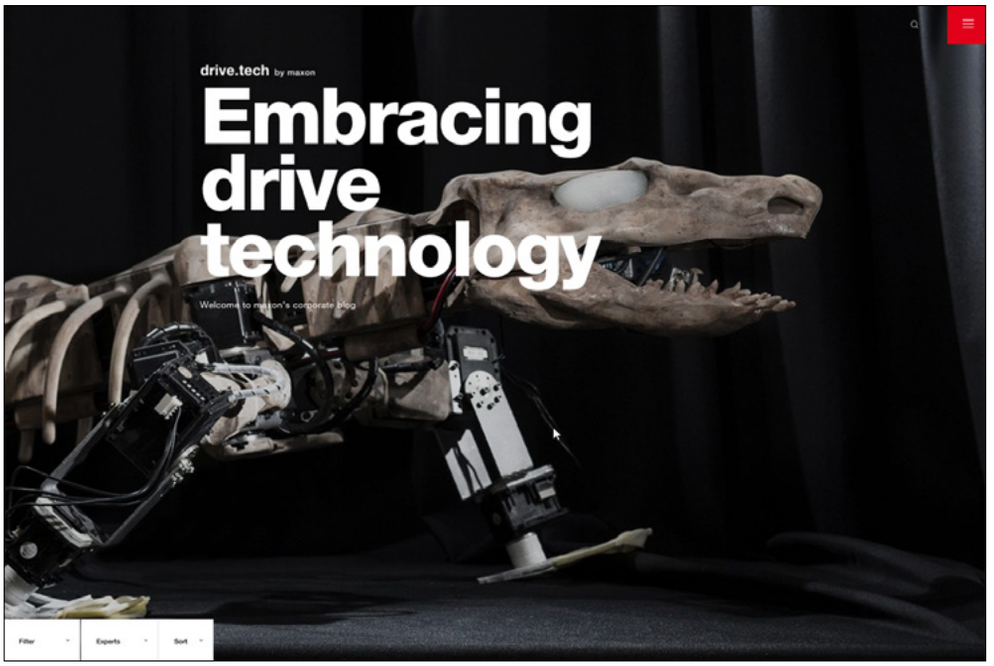
Configure and combine brushed and brushless DC motors, gearheads and compact drives according to your individual requirements. Fast, easy, and online. We guide you through our configurator step-by-step.

maxon selection program

Find the right drive by entering just a few parameters, such as supply voltage and torque. After you have entered the requirements of your drive, the maxon selection program shows the possible solution combinations from the maxon product program.

maxon Online Shop

In the maxon online shop, we provide a complete overview of all maxon products. You can also order your drive solution, download detailed product specifications and 3D CAD drawings immediately.



drive.tech

Drives and technology online

On our online platform drive.tech, you will find stories, technical reports, and videos about drive technology. Read blogs from our maxon experts, share content on social media, and stay up to date with our eNewsletter.

www.drive.tech

driven magazine

Read and experience

In driven, our print magazine, you can find exciting application stories, expert interviews, and other interesting stories in the world of drive technology. Available twice a year in print or in the Apple App Store or Google Play.

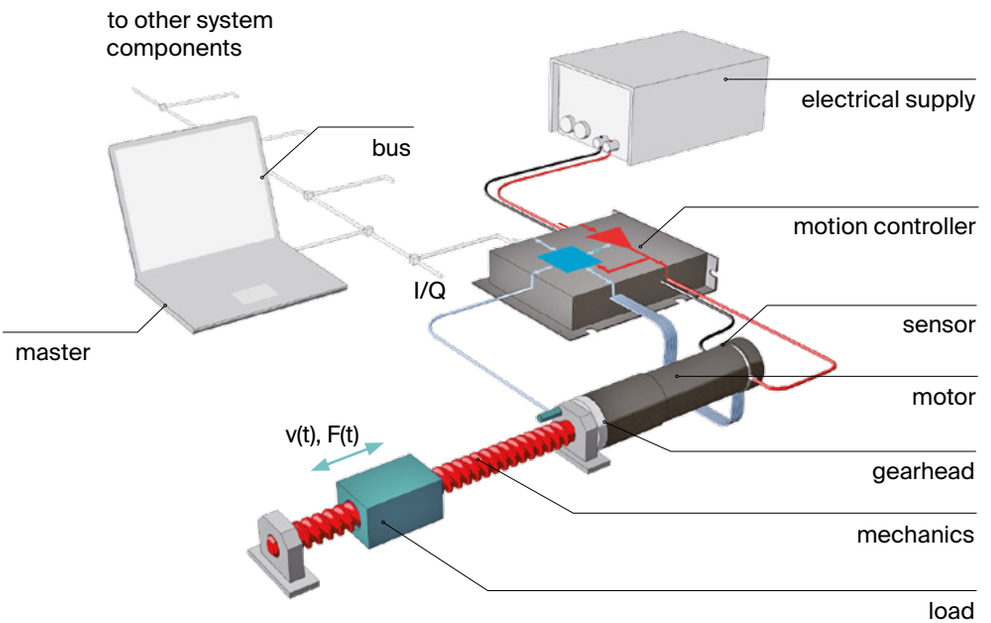
magazine.maxongroup.com


maxon academy
LABORATORY DC POWER SUPPLY
MODEL GPS-3030
VOLTAGE
AMPS
FINE
COARSE
GND

Increase your knowledge of drive technology and motion control

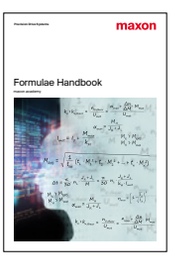
Learn more about the interaction of drive components, namely motor, gears, sensors and controllers. maxon academy brings together maxon products to provide ongoing education on drive technology. In addition to the maxon academy books and brochures, you will find E-learning modules, the currently planned seminars on drive technology and motion control as well as teaching material. These range from presentation and sample motors that can be taken apart for student exercises to models for hands-on training with suggestions for practical work.

academy.maxongroup.com



The selection of high-precision microdrives

Step by step from the specific formulation of the drive problem to its solution. Numerous tips and explanations, focusing only on theory where required for greater understanding. Various examples of applications deal with the practical aspects of drive technology. (Author: Dr. Urs Kafader, 149 pages, ISBN 978-3-9523654-5-8)



maxon Formula Compendium

Formulae, terms and explanations for all types of calculations concerning drive systems. Detailed collection with illustrations and descriptions. Flow chart for targeted drive selection.

New products

171	ECX SPEED 4 M, ∅4 mm, brushless, 0.5 Watt	NEW
172	ECX SPEED 4 L, ∅4 mm, brushless, 1.0 Watt	NEW
215	ECX TORQUE 22 M, ∅22 mm, brushless, 30 Watt	NEW
216	ECX TORQUE 22 L, ∅22 mm, brushless, 35 Watt	NEW
217	ECX TORQUE 22 XL, ∅22 mm, brushless, 40 Watt	NEW
221	IDX 56 M, ☐56 mm, brushless, 350 Watt	NEW
222	IDX 56 L, ☐56 mm, brushless, 400 Watt	NEW
267	EC-i 40, ∅40 mm, brushless, 130 Watt	NEW
270	EC-i 52, ∅52 mm, brushless, 250 Watt, open motor	NEW
271	EC-i 52, ∅52 mm, brushless, 420 Watt, ventilated	NEW
286	EC 45 flat, ∅43.5 mm, brushless, 50 Watt	NEW
287	EC 45 flat, ∅43.5 mm, brushless, 60 Watt, open rotor	NEW
288	EC 45 flat, ∅43.5 mm, brushless, 90 Watt, ventilated	NEW
289	EC 45 flat, ∅43.5 mm, brushless, 70 Watt	NEW
290	EC 45 flat, ∅43.5 mm, brushless, 80 Watt, open rotor	NEW
291	EC 45 flat, ∅43.5 mm, brushless, 120 Watt, ventilated	NEW
315	IDX 56 M, ☐56 mm, 233 Watt, Drive with positioning/speed controller	NEW
316	IDX 56 L, ☐56 mm, 283 Watt, Drive with positioning/speed controller	NEW
320	GPX 4 C, ∅4 mm, planetary gearhead, ceramic version	NEW
353	GPX 42 UP, ∅42 mm, planetary gearhead, ultra performance	NEW
354	GPX 52 A, ∅52 mm, planetary gearhead, standard version	NEW
354	GPX 52 UP, ∅52 mm, planetary gearhead, ultra performance	NEW
355	GPX 52 LN, ∅52 mm, planetary gearhead, noise reduced	NEW
428	ENX 4 MAG, Encoder, ∅4 mm, 1 ... 256 Impulse	NEW
495	EPOS4 Micro 24/5 CAN, positioning controller up to 120/360 Watt	NEW
495	EPOS4 Micro 24/5 EtherCAT, positioning controller up to 120/360 Watt	NEW
497	EPOS4 Compact 24/5 EtherCAT 3-axes, positioning controller up to 3x 120/360 Watt	NEW
522	Brake AB 34, 24 VDC, 1.0 Nm	NEW

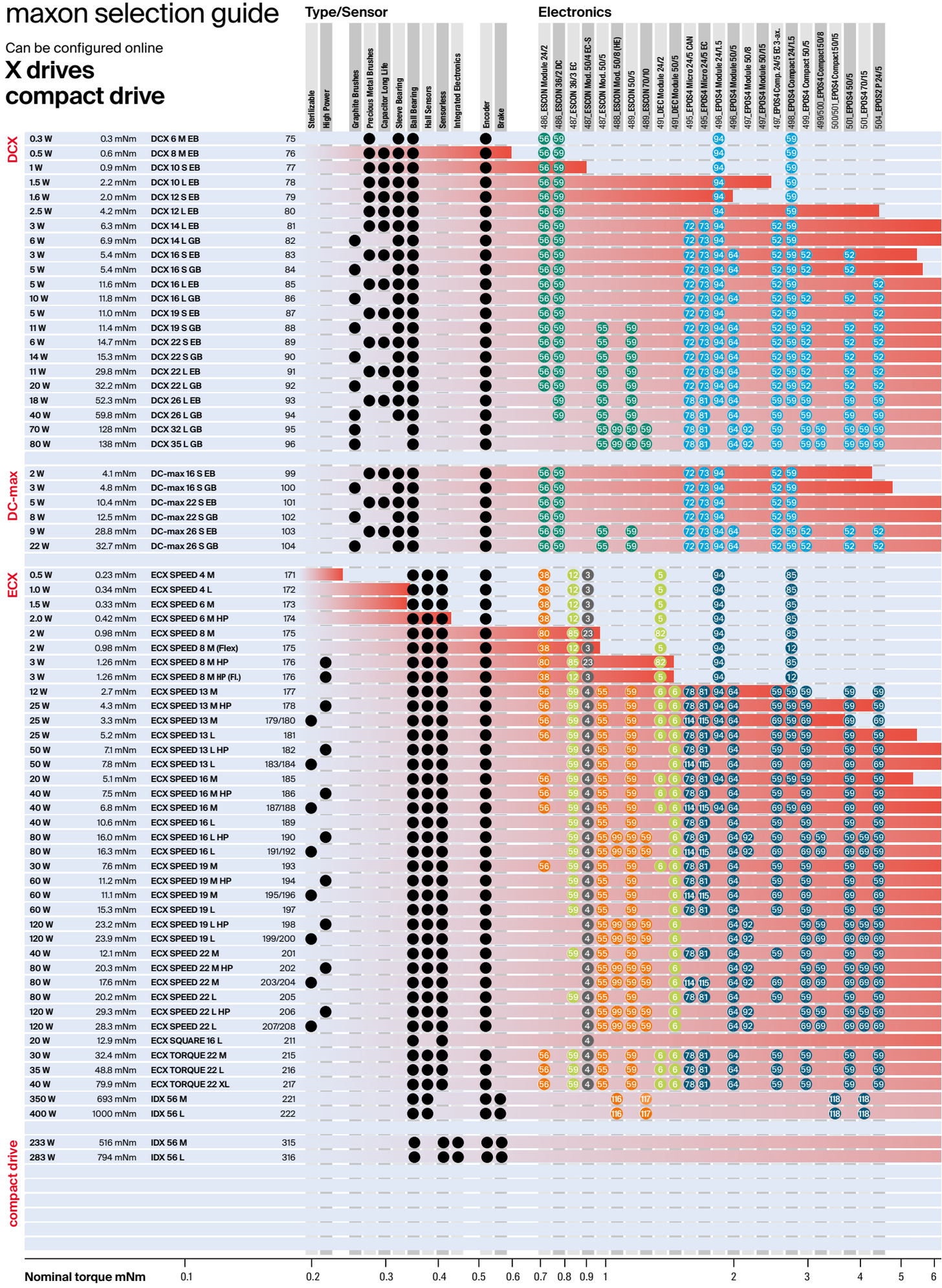
maxon selection guide

Classification of the maxon ranges according to performance classes. Performance, also in conjunction with size, is frequently a central requirement when considering drive systems. A preliminary size-related selection can be made from the different product ranges with the maxon selection guide. Our data sheets provide detailed specifications related to individual motors. Should you need any additional information, simply call us!

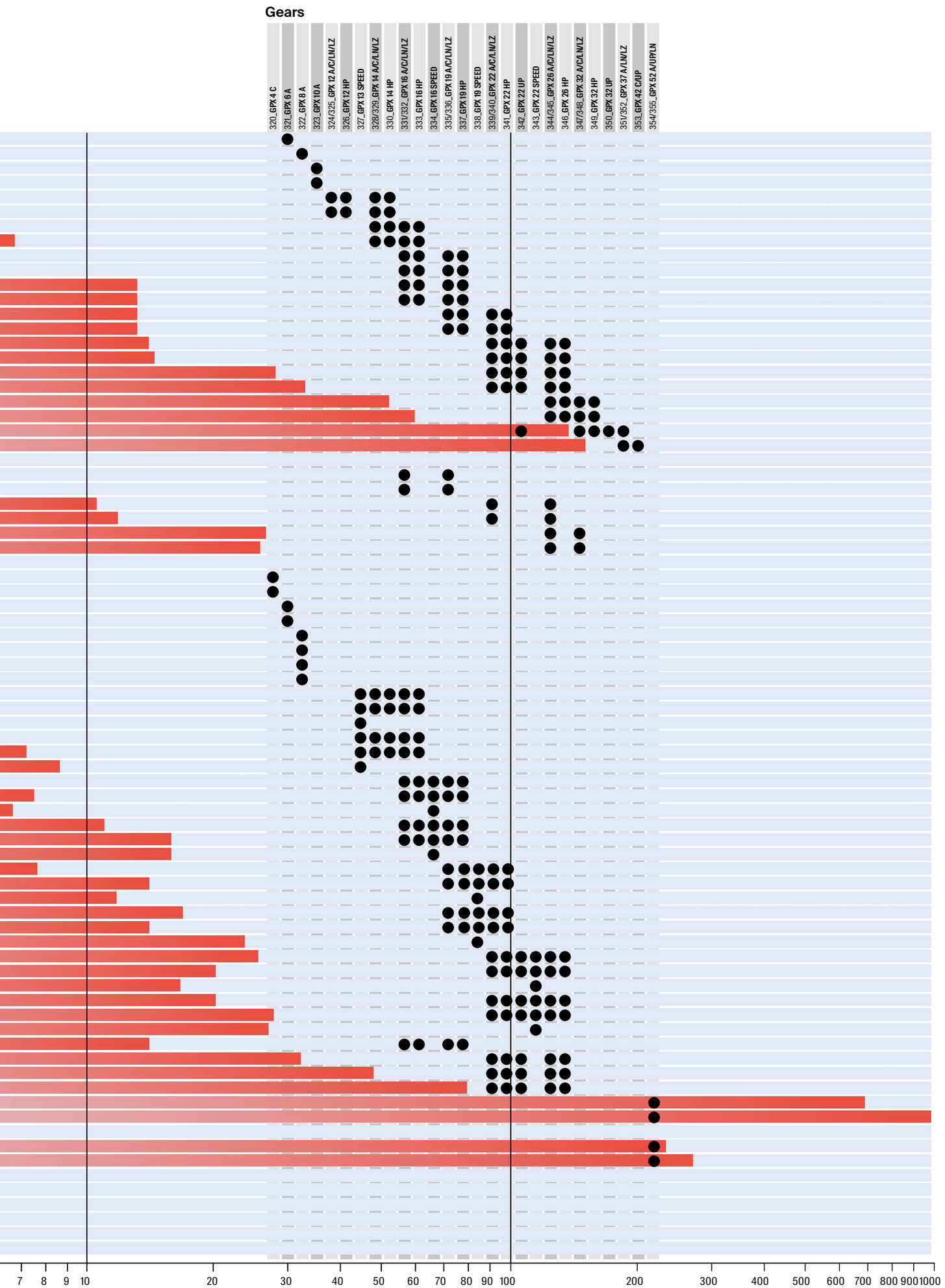
maxon selection guide

Can be configured online

X drives compact drive



DCX	0.3 W	0.3 mNm	DCX 6 M EB	75
	0.5 W	0.6 mNm	DCX 8 M EB	76
	1 W	0.9 mNm	DCX 10 S EB	77
	1.5 W	2.2 mNm	DCX 10 L EB	78
	1.6 W	2.0 mNm	DCX 12 S EB	79
	2.5 W	4.2 mNm	DCX 12 L EB	80
	3 W	6.3 mNm	DCX 14 L EB	81
	6 W	6.9 mNm	DCX 14 L GB	82
	3 W	5.4 mNm	DCX 16 S EB	83
	5 W	5.4 mNm	DCX 16 S GB	84
	5 W	11.6 mNm	DCX 16 L EB	85
	10 W	11.8 mNm	DCX 16 L GB	86
	5 W	11.0 mNm	DCX 19 S EB	87
	11 W	11.4 mNm	DCX 19 S GB	88
	6 W	14.7 mNm	DCX 22 S EB	89
	14 W	15.3 mNm	DCX 22 S GB	90
	11 W	29.8 mNm	DCX 22 L EB	91
	20 W	32.2 mNm	DCX 22 L GB	92
	18 W	52.3 mNm	DCX 26 L EB	93
	40 W	59.8 mNm	DCX 26 L GB	94
	70 W	128 mNm	DCX 32 L GB	95
	80 W	138 mNm	DCX 35 L GB	96
DC-max	2 W	4.1 mNm	DC-max 16 S EB	99
	3 W	4.8 mNm	DC-max 16 S GB	100
	5 W	10.4 mNm	DC-max 22 S EB	101
	8 W	12.5 mNm	DC-max 22 S GB	102
	9 W	28.8 mNm	DC-max 26 S EB	103
	22 W	32.7 mNm	DC-max 26 S GB	104
ECX	0.5 W	0.23 mNm	ECX SPEED 4 M	171
	1.0 W	0.34 mNm	ECX SPEED 4 L	172
	1.5 W	0.33 mNm	ECX SPEED 6 M	173
	2.0 W	0.42 mNm	ECX SPEED 6 M HP	174
	2 W	0.98 mNm	ECX SPEED 8 M	175
	2 W	0.98 mNm	ECX SPEED 8 M (Flex)	175
	3 W	1.26 mNm	ECX SPEED 8 M HP	176
	3 W	1.26 mNm	ECX SPEED 8 M HP (Fl.)	176
	12 W	2.7 mNm	ECX SPEED 13 M	177
	25 W	4.3 mNm	ECX SPEED 13 M HP	178
	25 W	3.3 mNm	ECX SPEED 13 M	179/180
	25 W	5.2 mNm	ECX SPEED 13 L	181
	50 W	7.1 mNm	ECX SPEED 13 L HP	182
	50 W	7.8 mNm	ECX SPEED 13 L	183/184
	20 W	5.1 mNm	ECX SPEED 16 M	185
	40 W	7.5 mNm	ECX SPEED 16 M HP	186
	40 W	6.8 mNm	ECX SPEED 16 M	187/188
	40 W	10.6 mNm	ECX SPEED 16 L	189
	80 W	16.0 mNm	ECX SPEED 16 L HP	190
	80 W	16.3 mNm	ECX SPEED 16 L	191/192
	30 W	7.6 mNm	ECX SPEED 19 M	193
	60 W	11.2 mNm	ECX SPEED 19 M HP	194
	60 W	11.1 mNm	ECX SPEED 19 M	195/196
	60 W	15.3 mNm	ECX SPEED 19 L	197
	120 W	23.2 mNm	ECX SPEED 19 L HP	198
	120 W	23.9 mNm	ECX SPEED 19 L	199/200
	40 W	12.1 mNm	ECX SPEED 22 M	201
	80 W	20.3 mNm	ECX SPEED 22 M HP	202
	80 W	17.6 mNm	ECX SPEED 22 M	203/204
	80 W	20.2 mNm	ECX SPEED 22 L	205
	120 W	29.3 mNm	ECX SPEED 22 L HP	206
	120 W	28.3 mNm	ECX SPEED 22 L	207/208
	20 W	12.9 mNm	ECX SQUARE 16 L	211
	30 W	32.4 mNm	ECX TORQUE 22 M	215
	35 W	48.8 mNm	ECX TORQUE 22 L	216
	40 W	79.9 mNm	ECX TORQUE 22 XL	217
	350 W	693 mNm	IDX 56 M	221
	400 W	1000 mNm	IDX 56 L	222
compact drive	233 W	516 mNm	IDX 56 M	315
	283 W	794 mNm	IDX 56 L	316

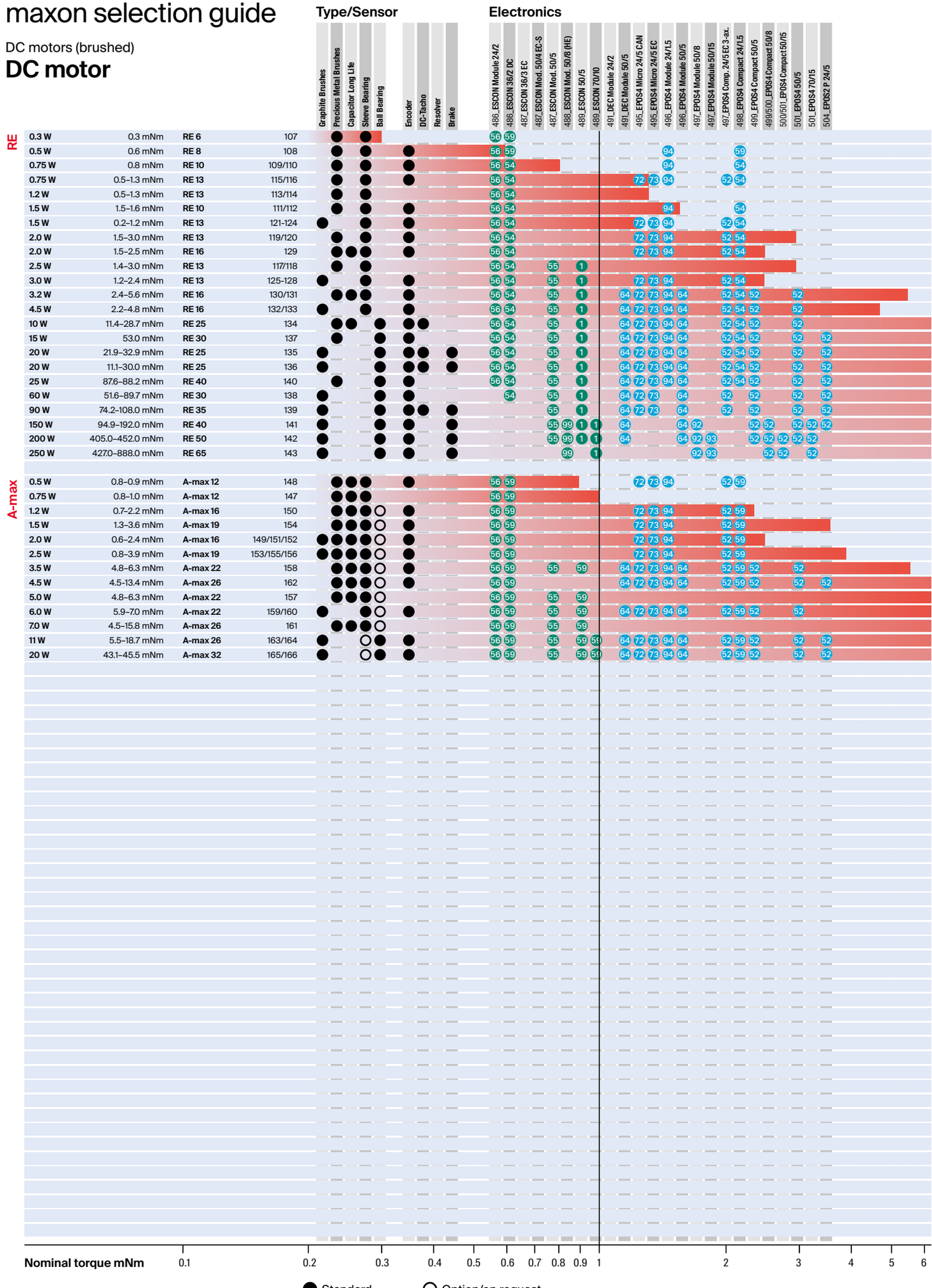


Description of numbers with detailed information about the connection on page 40

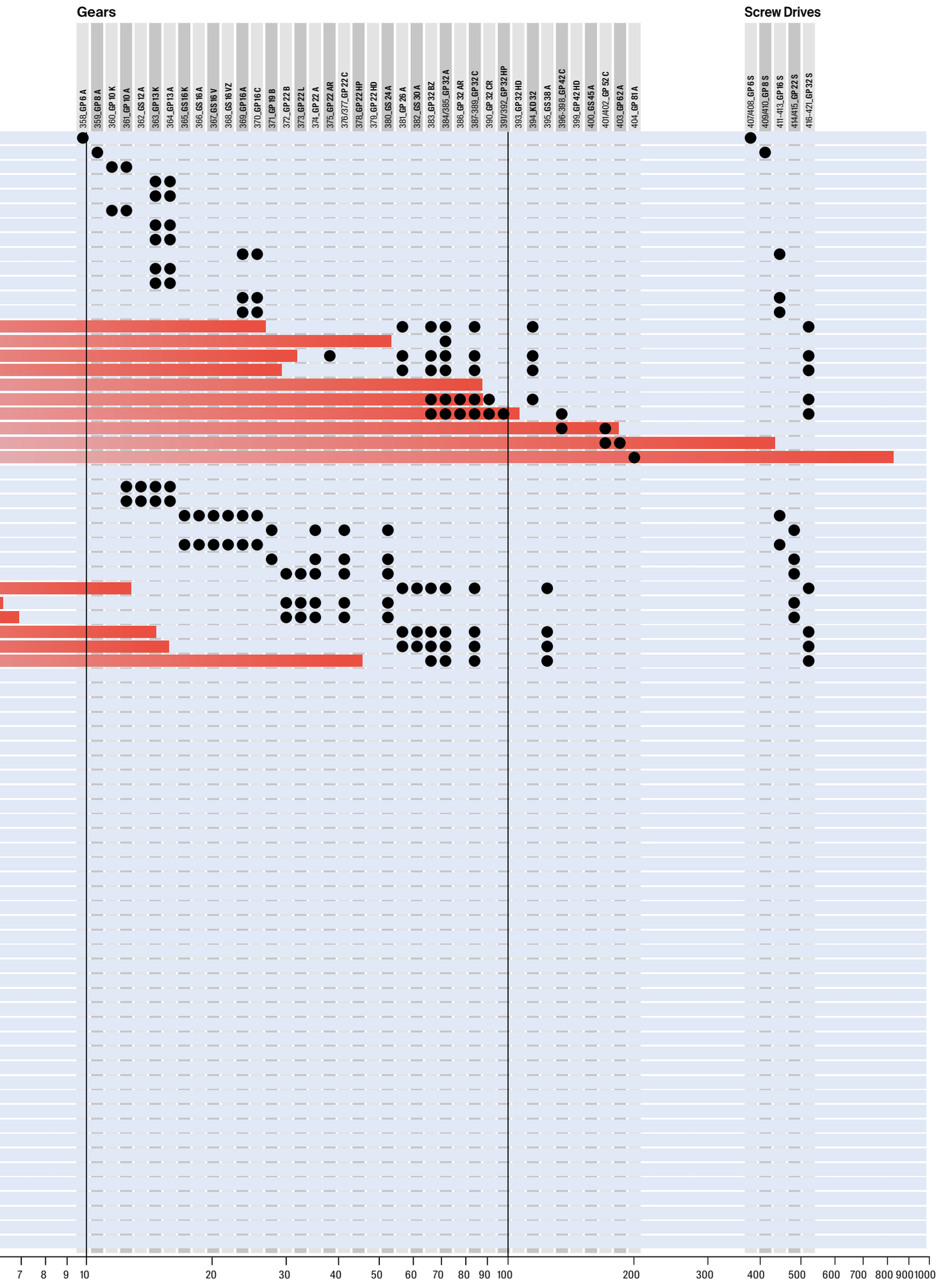
maxon selection guide

DC motors (brushed)

DC motor



RE	0.3 W	0.3 mNm	RE 6	107
	0.5 W	0.6 mNm	RE 8	108
	0.75 W	0.8 mNm	RE 10	109/110
	0.75 W	0.5–1.3 mNm	RE 13	115/116
	1.2 W	0.5–1.3 mNm	RE 13	113/114
	1.5 W	1.5–1.6 mNm	RE 10	111/112
	1.5 W	0.2–1.2 mNm	RE 13	121-124
	2.0 W	1.5–3.0 mNm	RE 13	119/120
	2.0 W	1.5–2.5 mNm	RE 16	129
	2.5 W	1.4–3.0 mNm	RE 13	117/118
	3.0 W	1.2–2.4 mNm	RE 13	125-128
	3.2 W	2.4–5.6 mNm	RE 16	130/131
	4.5 W	2.2–4.8 mNm	RE 16	132/133
	10 W	11.4–28.7 mNm	RE 25	134
	15 W	53.0 mNm	RE 30	137
	20 W	21.9–32.9 mNm	RE 25	135
	20 W	11.1–30.0 mNm	RE 25	136
	25 W	87.6–88.2 mNm	RE 40	140
	60 W	51.6–89.7 mNm	RE 30	138
	90 W	74.2–108.0 mNm	RE 35	139
	150 W	94.9–192.0 mNm	RE 40	141
	200 W	405.0–452.0 mNm	RE 50	142
	250 W	427.0–888.0 mNm	RE 65	143
A-max	0.5 W	0.8–0.9 mNm	A-max 12	148
	0.75 W	0.8–1.0 mNm	A-max 12	147
	1.2 W	0.7–2.2 mNm	A-max 16	150
	1.5 W	1.3–3.6 mNm	A-max 19	154
	2.0 W	0.6–2.4 mNm	A-max 16	149/151/152
	2.5 W	0.8–3.9 mNm	A-max 19	153/155/156
	3.5 W	4.8–6.3 mNm	A-max 22	158
	4.5 W	4.5-13.4 mNm	A-max 26	162
	5.0 W	4.8–6.3 mNm	A-max 22	157
	6.0 W	5.9–7.0 mNm	A-max 22	159/160
	7.0 W	4.5–15.8 mNm	A-max 26	161
	11 W	5.5–18.7 mNm	A-max 26	163/164
	20 W	43.1–45.5 mNm	A-max 32	165/166

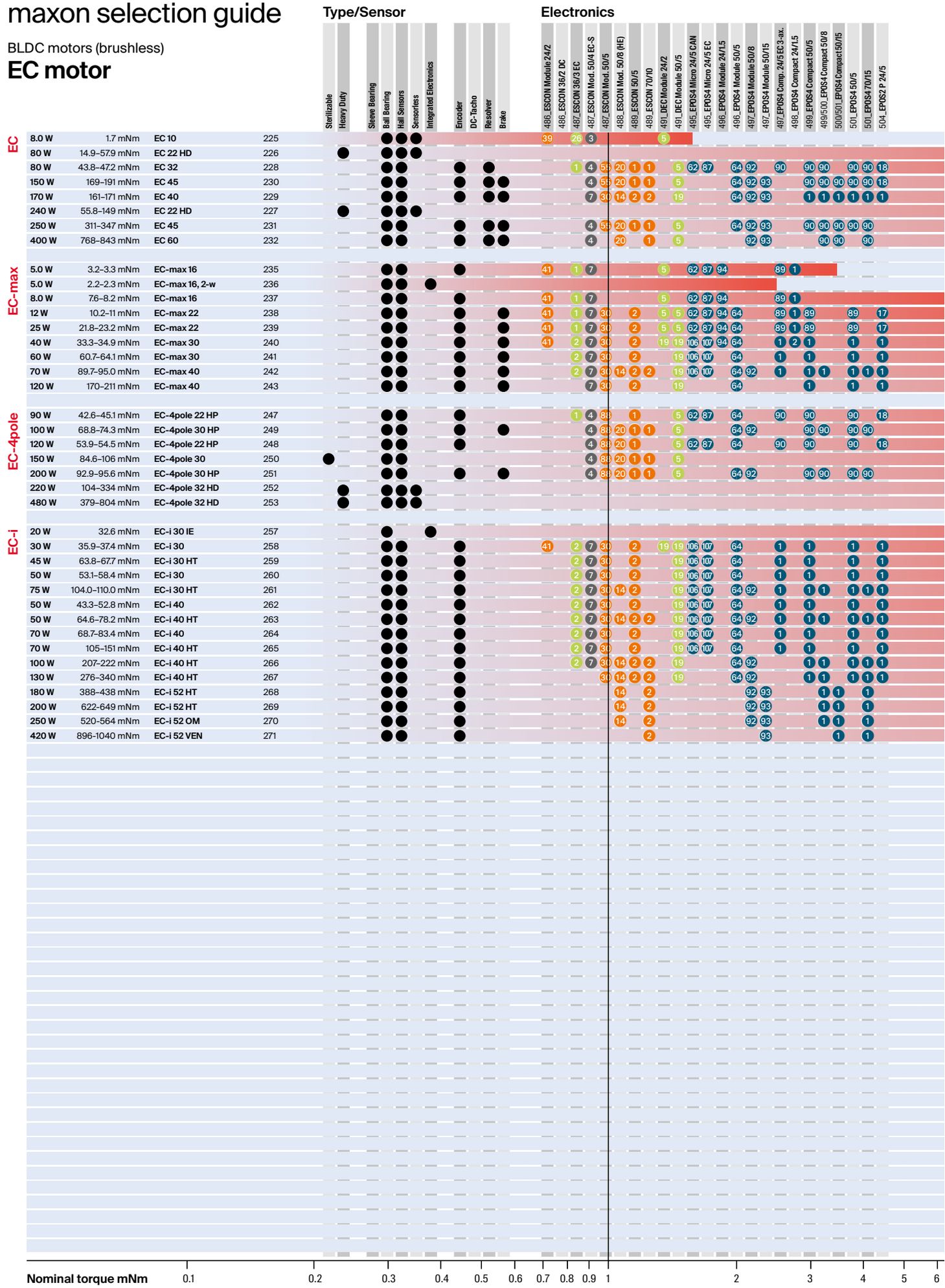


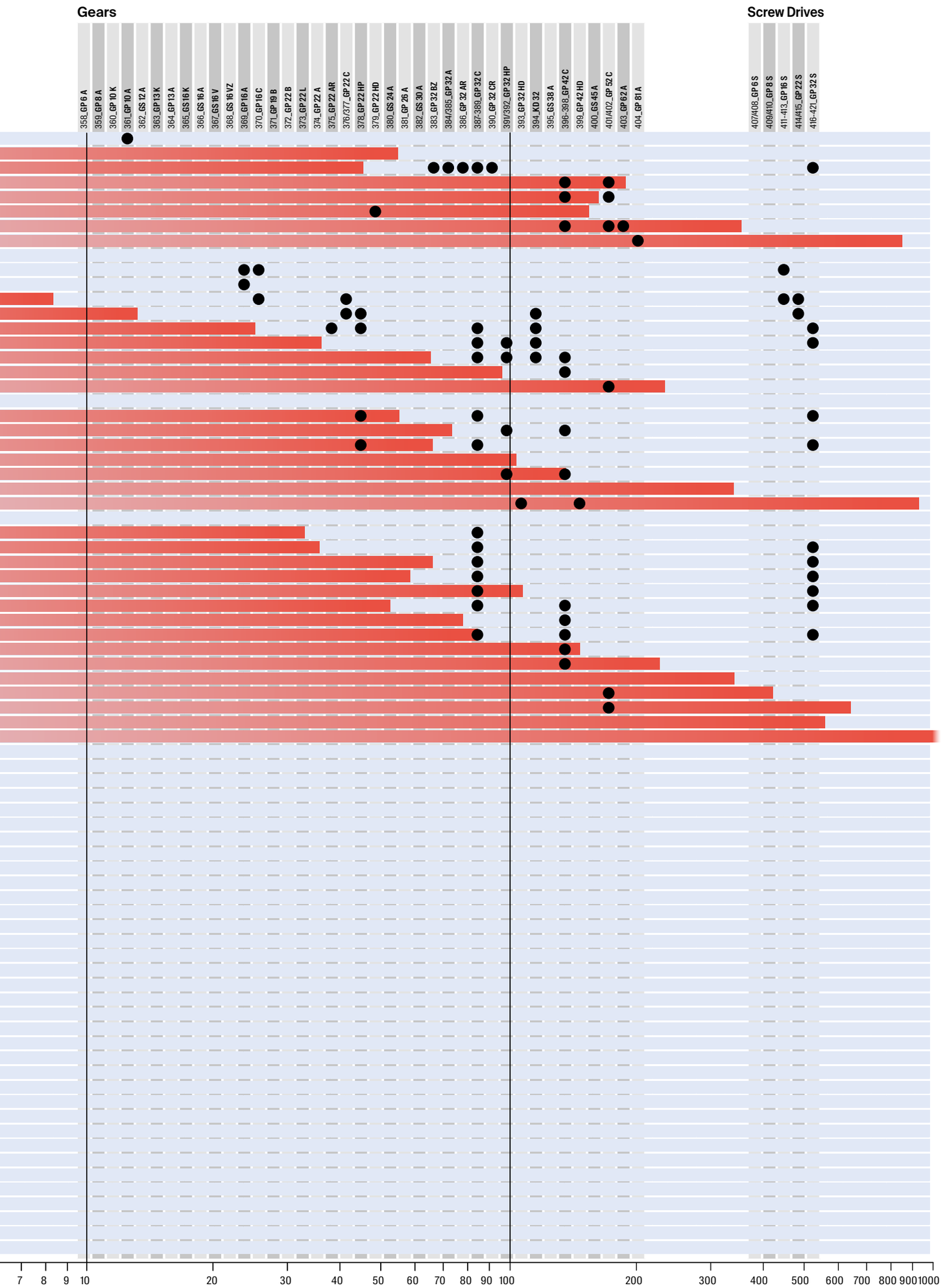
Description of numbers with detailed information about the connection on page 40

maxon selection guide

BLDC motors (brushless)

EC motor



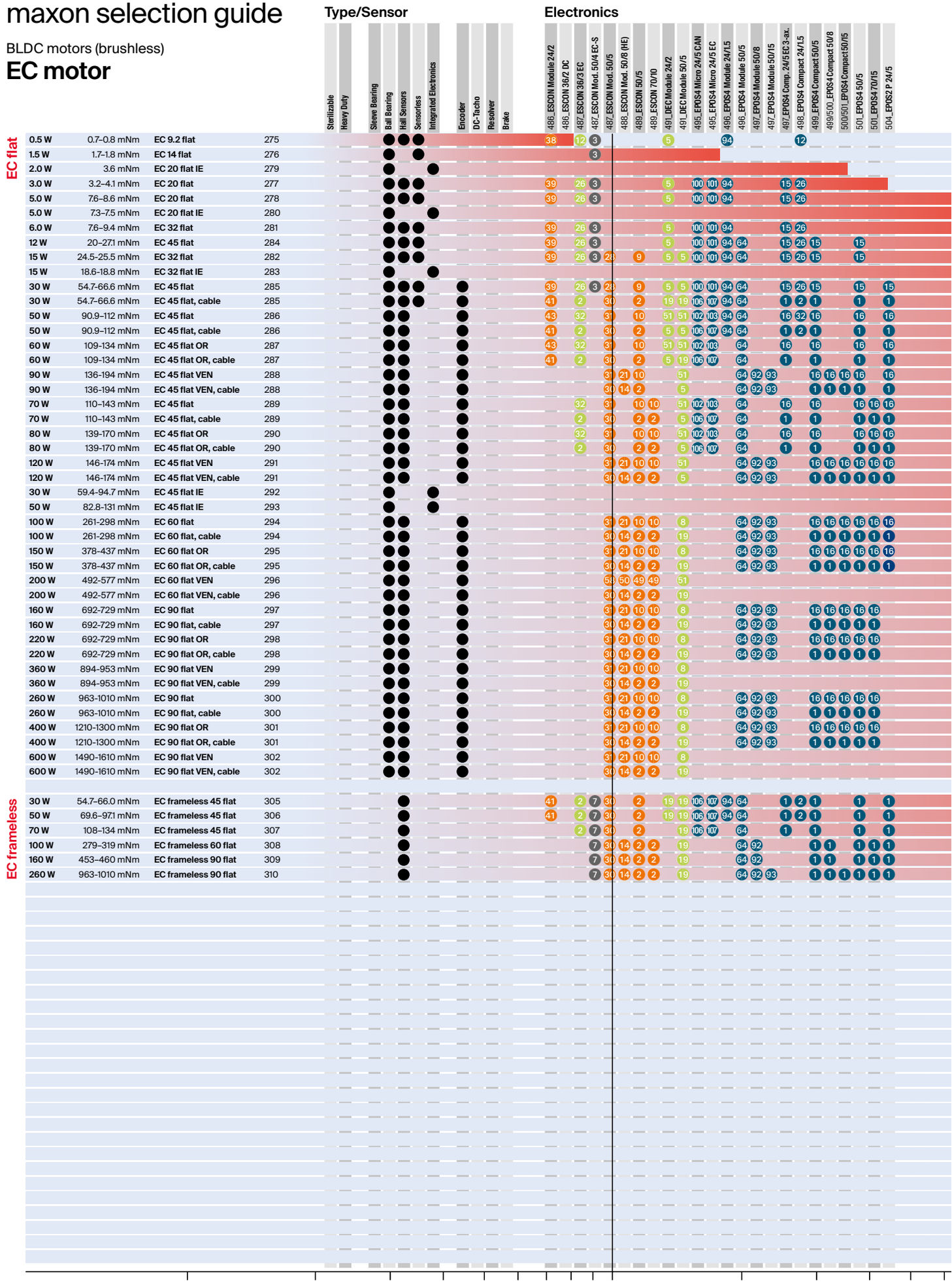


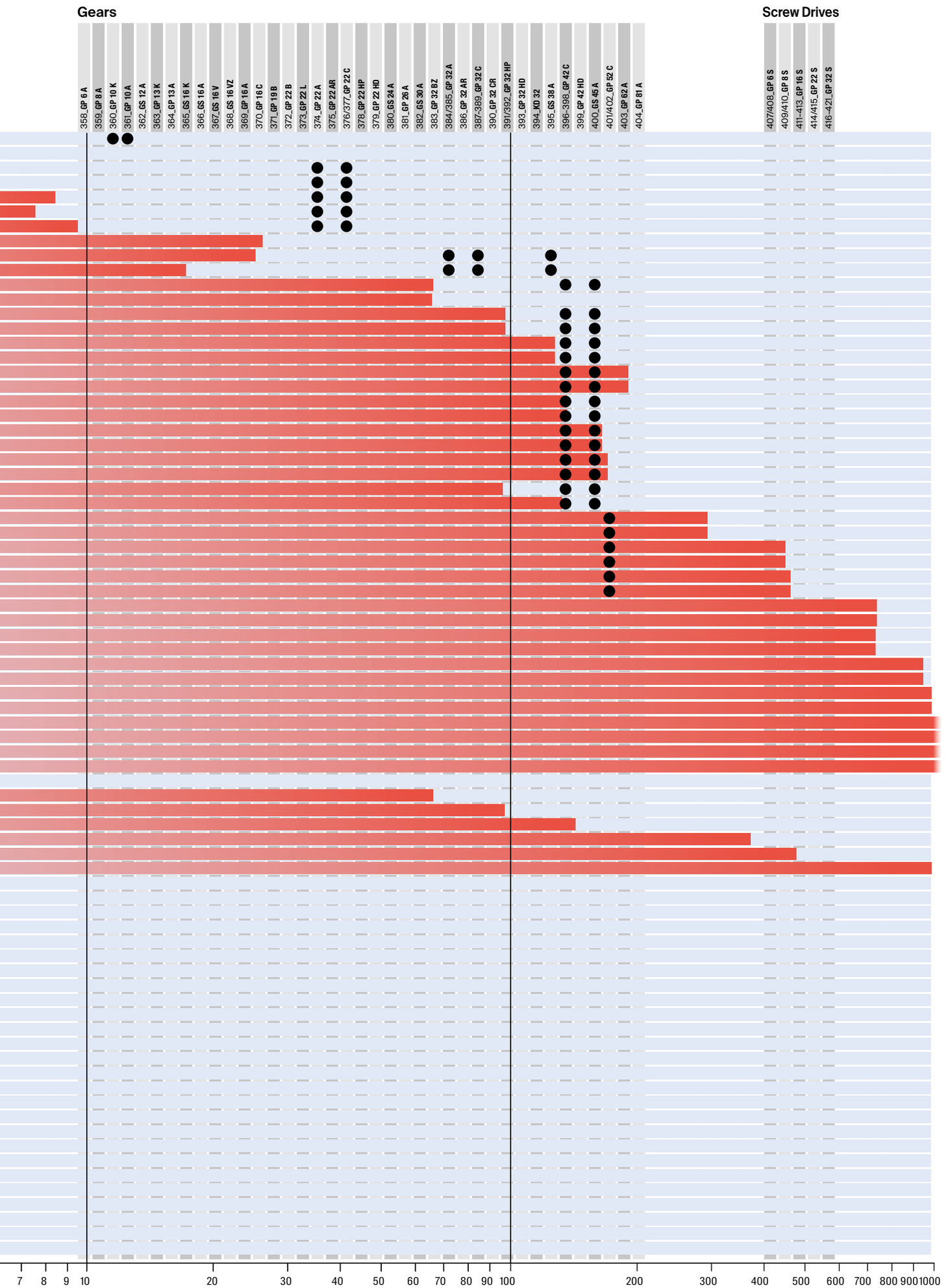
Description of numbers with detailed information about the connection on page 40

maxon selection guide

BLDC motors (brushless)

EC motor





Description of numbers with detailed information about the connection on page 40

Accessories overview

The following table contains information on connecting maxon motors with maxon controllers. All listed adapters, plugs, evaluation boards, etc. must be ordered separately. The numbers refer to the Selection Guide pages 32–42.

1 Can be connected directly. No accessories required.
2 Can be connected directly. Plug must be removed.
3 ESCON Module Motherboard sensorless 450237 and adapter 220310 required.
4 ESCON Module Motherboard sensorless 450237 required.
Can be connected directly with suitable configuration.
5 Evaluation board 370652 required.
6 Evaluation board 370652 required. Can be connected directly with suitable configuration.
7 ESCON Module Motherboard sensorless 450237 required. Plug must be removed.
8 Evaluation board 370652 and extension cable 339380 required.
9 Adapter 220300 required.
10 Extension cable 339380 required.
11 Adapter 418721 required.
12 Adapter 418723 required.
13 ESCON Module Motherboard sensorless 450237 and extension cable 339380 required.
14 ESCON Module 50/8 Motherboard 586048 required. Connectors at the motor need to be removed.
15 Adapter 220300, extension cable 275878 and extension cable 275851 required.
16 Extension cable 354045 required.
17 Plug set 384915 required. Plug must be removed.
18 Plug set 384915 required.
19 Evaluation board 370652 required. Connectors at the motor need to be removed.
20 ESCON Module 50/8 Motherboard 586048 required.
21 ESCON Module 50/8 Motherboard 586048 and extension cable 339380 required.
22 Adapter 262359 and cable 354046 required. Connector needs to be removed.
23 ESCON Module Motherboard sensorless 450237 and adapter 498157 required.
24 ESCON Module 24/2 Motherboard 486400 required.
25 Evaluation board 370652 and adapter 425931 required.
26 Adapter 418719 required.
27 Adapter 425931 and cable 354046 (remove connector on one end) required.
Install solder bridge (jumper) on circuit board.
28 ESCON Module Motherboard 438779 and adapter 220300 required.
29 Adapter 459875 required.
30 ESCON Module Motherboard 438779 required. Plug must be removed.
31 ESCON Module Motherboard 438779 and extension cable 339380 required.
32 Extension cable 442086 required.
33 Plug set 451746 required. Plug must be removed.
34 Plug set 451746 required.
35 Adapter 262359, cable 354046 and extension cable 3409.506
(6-pin connector needs to be removed) required.
36 ESCON Module Motherboard 586048, adapter 223774, and extension cable 3409.506
(6-pin connector needs to be removed) required.
37 ESCON Module Motherboard 586048 and adapter 223774 required. Connector needs to be removed.
38 ESCON Module 24/2 Motherboard 486400 and adapter 425931 required.
39 ESCON Module 24/2 Motherboard 486400 and adapter 220300 required.
40 ESCON Module 24/2 Motherboard 486400 and adapter 405120 required.
41 ESCON Module 24/2 Motherboard 486400 required; connector needs to be removed.
42 ESCON Module 50/8 Motherboard 586048 and extension cable 354046 required.
43 ESCON Module 24/2 Motherboard 486400 and extension cable 339380 required.
44 ESCON Module 24/2 Motherboard 486400 and adapter 459875 required.
45 Can be connected directly. Attach solder bridge (Jumper) to printed circuit board.
46 Can be connected directly. Connect via encoder connection.
47 Adapter 327086 required.
48 Extension cable 303490 required.
49 Cable 520851 and 275878 required.
50 ESCON Module 50/8 Motherboard 546048 and cable 520851 and 275878 required.
51 EVA Board 370652 and extension cable 442086 required.
52 Extension cable 275851 required.
53 Adapter 327086 required. Attach solder bridge (Jumper) to printed circuit board.
54 Extension cable 403962 required, for motors with terminals.
55 ESCON Module Motherboard 438779 required. Can be connected directly with suitable configuration.
56 ESCON Module 24/2 Motherboard 486400 required. Can be connected directly with suitable configuration.
57 ESCON Module 24/2 Motherboard 486400 and adapter 223774 required. Connector needs to be removed.
58 ESCON Module Motherboard 438779 and cable 520851 and 275878 required.
59 Can be connected directly with suitable configuration.
60 Adapter 223774 or 262359 and cable 354046.
61 Adapter 223774 and extension cable 3409.506 (6 poles plug must be removed) required.
62 Intended for use with customer-specific motherboard. Combination with EPOS4 EB Micro (638677) possible.
Connector set 520859 required. Connector needs to be removed.
63 ESCON Module Motherboard 438779 and adapter 459875 required.
64 Intended for use with customer-specific Motherboard.
Combination with EPOS4 CB 50/5 CAN (534133) yields EPOS4 Compact 50/5 CAN (541718).
65 Can be connected directly. Attach solder bridges (jumpers) to printed circuit board.
66 Adapter 223774 or 262359 and cable 354046. Connector needs to be removed.
67 Extension cable 403964 required.
68 Adapter 425931 and extension cable 354046 required. Connector needs to be removed.
69 Cable 275851 and cable 275878 required.
70 Extension cable 354046 required.
71 Adapter 405120 required.
72 Intended for use with customer-specific motherboard. Combination with EPOS4 EB Micro (638677) possible.
Extension cable 275851 required.
73 Intended for use with customer-specific motherboard. Combination with EPOS4 EB Micro (638677) and
EPOS4 MB Micro EtherCAT 3-axes (659508) possible. Extension cable 275851 required.
74 Extension cable 302948 required.
75 ESCON Module Motherboard 438779 and extension cable 354046 required.
76 ESCON Module Motherboard 438779 and adapter 223774 required. Plug must be removed.
77 Adapter 498157 and cable 403962 required.
78 Intended for use with customer-specific motherboard. Combination with EPOS4 EB Micro (638677) possible.
Can be connected directly when combined with Molex connector.
79 ESCON Module Motherboard 438779, adapter 223774 and extension cable 3409.506
(6-pin plug must be removed) are required.
80 ESCON Module 24/2 Motherboard 486400 and adapter 498157 required.
81 Intended for use with customer-specific motherboard. Combination with EPOS4 EB Micro (638677) and
EPOS4 MB Micro EtherCAT 3-axes (659508) possible. Can be connected directly when combined with
Molex connector.
82 DEC Module Evaluation board 370652 and adapter 498157 required.
83 Adapter 488167 and cable 300586 required.
84 Adapter 488167 and cable 451290 required.
85 Adapter 498157 required.
86 Adapter 498157 and cable 302948 required.
87 Intended for use with customer-specific motherboard. Combination with EPOS4 EB Micro (638677) and
EPOS4 MB Micro EtherCAT 3-axes (659508) possible. Connector set 520859 required.
Connector needs to be removed.
88 ESCON Module Motherboard 438779 required.
89 Plug set 520859 required. Plug must be removed.
90 Plug set 520859 required.
91 Adapter 488167 and cable 520852 required.
92 Intended for use with customer-specific Motherboard. Combination with EPOS4 CB Power CAN (520884)
yields EPOS4 Compact 50/8 CAN (520885).
93 Intended for use with customer-specific Motherboard. Combination with EPOS4 CB Power CAN (520884)
yields EPOS4 Compact 50/15 CAN (520886).
94 Intended for use with customer-specific Motherboard. Combination with EPOS4 CB 24/1.5 CAN (536997)
yields EPOS4 Compact 24/1.5 CAN (546714).
95 Adapter 488167 and cable 378173 required.
96 Adapter 425931, cable 403962 and cable 354046 (plug must be removed from one side) required.
97 Adapter 549609 required.
98 ESCON Module Motherboard 438779 and adapter 549609 required.
99 ESCON Module 50/8 Motherboard 586048 required. Can be connected directly with suitable configuration.
99 ESCON Module 50/8 Motherboard 586048 required. Can be connected directly with suitable configuration.
100 Intended for use with customer-specific motherboard. Combination with EPOS4 EB Micro (638677) possible.
Adapter 220300, extension cable 275878 and extensioncable 275851 required.
101 Intended for use with customer-specific motherboard. Combination with EPOS4 EB Micro (638677) and
EPOS4 MB Micro EtherCAT 3-axes (659508) possible. Adapter 220300, extension cable 275878 and
extension cable 275851 required.
102 Intended for use with customer-specific motherboard. Combination with EPOS4 EB Micro (638677) possible.
Extension cable 354045 required.
103 Intended for use with customer-specific motherboard. Combination with EPOS4 EB Micro (638677) and
EPOS4 MB Micro EtherCAT 3-axes (659508) possible. Extension cable 354045 required.
104 Intended for use with customer-specific motherboard. Combination with EPOS4 EB Micro (638677) possible.
Adapter 405120 required.
105 Intended for use with customer-specific motherboard. Combination with EPOS4 EB Micro (638677) and
EPOS4 MB Micro EtherCAT 3-axes (659508) possible. Adapter 405120 required.
106 Intended for use with customer-specific motherboard. Combination with EPOS4 EB Micro (638677) possible.
Can be connected directly.
107 Intended for use with customer-specific motherboard. Combination with EPOS4 EB Micro (638677) and
EPOS4 MB Micro EtherCAT 3-axes (659508) possible. Can be connected directly.
108 Intended for use with customer-specific motherboard. Combination with EPOS4 EB Micro (638677) possible.
Adapter 488167 and cable 520852 required.
109 Intended for use with customer-specific motherboard. Combination with EPOS4 EB Micro (638677) and
EPOS4 MB Micro EtherCAT 3-axes (659508) possible. Adapter 488167 and cable 520852 required.
110 Intended for use with customer-specific motherboard. Combination with EPOS4 EB Micro (638677) possible.
Extension cable 354046 required.
111 Intended for use with customer-specific motherboard. Combination with EPOS4 EB Micro (638677) and
EPOS4 MB Micro EtherCAT 3-axes (659508) possible. Extension cable 354046 required.
112 Intended for use with customer-specific motherboard. Combination with EPOS4 EB Micro (638677) possible.
Adapter 223774 or 262359 and cable 354046. Connector needs to be removed.
113 Intended for use with customer-specific motherboard. Combination with EPOS4 EB Micro (638677) and
EPOS4 MB Micro EtherCAT 3-axes (659508) possible. Adapter 223774 or 262359 and cable 354046.
Connector needs to be removed.
114 Intended for use with customer-specific motherboard. Combination with EPOS4 EB Micro (638677) possible.
Motor with cable configured. Cable 275851 and cable 275878 required.
115 Intended for use with customer-specific motherboard. Combination with EPOS4 EB Micro (638677) and
EPOS4 MB Micro EtherCAT 3-axes (659508) possible. Motor with cable configured. Cable 275851 and
cable 275878 required.
116 IDX power cable (684644, 684646, 684647 or 684648) and IDX sensor cable (684650 or 684651) required.
Motherboard 586048, adapter 262359 and cable 354046 required.
117 IDX power cable (684644, 684646, 684647 or 684648) and IDX sensor cable (684650 or 684651) required.
Adapter 262359 and cable 354046 required.
118 IDX power cable (684644, 684646, 684647 or 684648) and IDX sensor cable (684650 or 684651) required.
Connector set 520859, adapter 262359 and cable 354046 required.

EC motor

- At least 2 channel encoder with line driver or Hall sensors required
- For motors with Hall sensors, with or without encoders
- For motors with Hall sensors
- For motors without Hall sensors

DC motor

- For motors with/without sensors
- At least 2 channel encoder with line driver required

maxon selection guide

Encoder, DC tacho, resolver

sensor

Recommended Electronics

				Sterilizable	486_ESCON Module 24/2	486_ESCON 36/2 DC	487_ESCON 36/3 EC	487_ESCON Mod. 50/4 EC-S	487_ESCON Mod. 50/5	488_ESCON Mod. 50/8 (HE)	489_ESCON 50/5	489_ESCON 70/10	491_DEC Module 24/2	491_DEC Module 50/5	495_EPOS4 Micro 24/5 CAN	495_EPOS4 Micro 24/5 EC	496_EPOS4 Module 24/1.5	496_EPOS4 Module 50/5	497_EPOS4 Module 50/8	497_EPOS4 Module 50/15	497_EPOS4 Comp. 24/5 EC 3-ax.	498_EPOS4 Compact 24/1.5	499_EPOS4 Compact 50/5	499/500_EPOS4 Compact 50/8	500/501_EPOS4 Compact 50/15	501_EPOS4 50/5	501_EPOS4 70/15	504_EPOS2 P 24/5
ENX	**ENX 4/6/8 MAG**	1–256 CPT, 3 channel	428-430		80	85											94					85						
	ENX 8 EASY INT	1–1024 CPT, 3 channel	431		80												94					85						
	ENX 8 EASY INT Absolute	4096 steps, Single Turn	432														94					91						
	ENX 10 EASY	1–1024 CPT, 3 channel	433		40	1			98		97	97			104	105	94	64	92		71	97	97	97		97		97
	ENX 10 QUAD	4 CPT, 2 channel	433																									
	ENX 10 EASY XT	1–1024 CPT, 3 channel	434		24	1			88		1	1			106	107	94	64	92		1	1	1	1		1		1
	ENX 13 EASY INT	1–1024 CPT, 3 channel	435	●	24				88		1				106	107	94	64			1	1	1			1		1
	ENX 13 EASY INT Absolute	4096 steps, Single Turn	435	●											62	37	94	64			90	94	90			90		
	ENX 16 EASY	1–1024 CPT, 3 channel	436		24	1			88	20	1	1			106	107	94	64	92	93	1	1	1	1	1	1	1	1
	ENX 16 EASY XT	1–1024 CPT, 3 channel	437		24	1			88		1	1			106	107	94	64	92	93	1	1	1	1	1	1	1	1
	ENX 16 EASY Absolute	4096 steps, Single Turn	438												106	107	94	64	92	93	91	91	91	91	91	91	91	
	ENX 16 EASY Absolute XT	4096 steps, Single Turn	439												106	107	94	64	92	93	1	1	1	1	1	1	1	
	ENX 16 EASY INT	1–1024 CPT, 3 channel	440	●	24				88	20	1	1			106	107	94	64	92		1	1	1	1		1		1
	ENX 16 EASY INT Absolute	4096 steps, Single Turn	440	●											62	37	94	64	92		90	90	90	90		90		
	ENX 19 EASY INT	1–1024 CPT, 3 channel	441	●	24				88	20	1	1			106	107	94	64	92		1	1	1	1		1		
	ENX 19 EASY INT Absolute	4096 steps, Single Turn	441	●											62	37	94	64	92		90	90	90	90		90		
	ENX 22 EASY INT	1–1024 CPT, 3 channel	442	●	24				88	20	1	1			106	107	94	64	92		1	1	1	1		1		1
	ENX 22 EASY INT Absolute	4096 steps, Single Turn	442	●											62	37	94	64	92		90	90	90	90		90		
	ENX 16 RIO	512–65536 CPT, 3 channel	443		24	1			88	20	1	1			106	107	94	64	92	93	1	1	1	1	1	1	1	1
sensor	**Encoder MILE**	256–2048 CPT, 2 channel, LD	446						75		70				110	111	94	64	92		70	70	70	70		70		70
	Encoder MILE	256–2048 CPT, 2 channel, LD, cable	446		24				88		1				106	107	94	64			1	1	1			1		1
	Encoder MILE	512–4096 CPT, 2 channel, LD	447						75	42	70	70			110	111		64	92	93	70		70	70	70	70	70	70
	Encoder MILE	512–4096 CPT, 2 channel, LD, cable	447						88	20	1	1			106	107		64	92	93	1		1	1	1	1	1	
	Encoder MILE	512–6400 CPT, 2 channel, LD	448						75	42	70	70			110	111		64	92	93	70		70	70	70	70	70	
	Encoder MILE	512–6400 CPT, 2 channel, LD, cable	448						88	20	1	1			106	107		64	92	93	1		1	1	1	1	1	1
	Encoder 16 EASY	128–1024 CPT, 3 channel, LD	449-450						88	20	1	1			106	107		64	92	93			1	1	1	1	1	1
	Encoder 16 EASY XT	128–1024 CPT, 3 channel, LD	451-452		24	1			88		1	1			106	107	94	64	92	93	1	1	1	1	1	1	1	1
	Encoder 16 EASY Absolute SSI	4096 steps, Single Turn	453												108	109		64	92	93	91		91	91	91	91	91	
	Encoder 16 EASY Absolute BiSS-C	4096 steps, Single Turn	454																									
	Encoder 16 EASY Absolute XT SSI	4096 steps, Single Turn	455												106	107	94	64	92	93	1	1	1	1	1	1	1	
	Encoder 16 EASY Absolute XT BiSS-C	4096 steps, Single Turn	456																									
	Encoder MR, type S	16 CPT, 2 channel	457		57	66			76		22																	
	Encoder MR, type S	64–256 CPT, 2 channel, LD	458			47												94				53						
	Encoder MR, type S	100 CPT, 2 channel, LD	458			68												94				27						
	Encoder MR, type S	64–256 CPT, 2 channel	459		57	66			76		22							94				66						
	Encoder MR, type M	32 CPT, 2/3 channel	460		57	66			76		22				112	113	94	64			66	66	66			66		
	Encoder MR, type M	128–512 CPT, 2/3 channel, LD (DC motor)	461		44	65			63		29						94	64				65	65			65		
	Encoder MR, type M	128–512 CPT, 2/3 channel, LD (EC motor)	462		24				88	20	1	1			106	107	94	64	92	93	1	1	1	1	1	1	1	1
	Encoder MR, type ML	128–1000 CPT, 3 channel, LD	463		24	1			88		1	1			106	107	94	64	92	93	1	1	1	1	1	1	1	1
	Encoder MR, type L	256–1024 CPT, 3 channel, LD	464		24	1			88	20	1	1			106	107	94	64	92	93	1	1	1	1	1	1	1	1
	Encoder 16 RIO	1024–32768 CPT, 3 channel	466-467						88	20	1	1			106	107	94	64	92	93	1	1	1	1	1	1	1	1
	Encoder Enc 22	100 CPT, 2 channel	468																									
	Encoder AEDL 5810	1024–5000 CPT, 3 channel, LD	469-470		24	1			88	20	1	1			106	107	94	64	92	93	1	1	1	1	1	1	1	1
	Encoder HEDS 5540	500 CPT, 3 channel	471-472		79	61			79	36	35	35																
	Encoder HEDL 5540	500 CPT, 3 channel	473-477		24	1			88	20	1	1			106	107	94	64	92	93	1	1	1	1	1	1	1	1
	Encoder HEDL 9140	500 CPT, 3 channel	478-479						76	37	22	22			112	113		64	92	93	66		60	60	60		60	60
	DC-Tacho DCT 22	0.52 V	480		24	67			88	20	1	1																

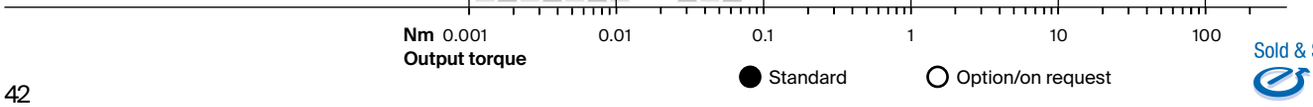
Description of numbers with detailed information about the connection on page 40

maxon selection guide

Planetary and spur gearheads

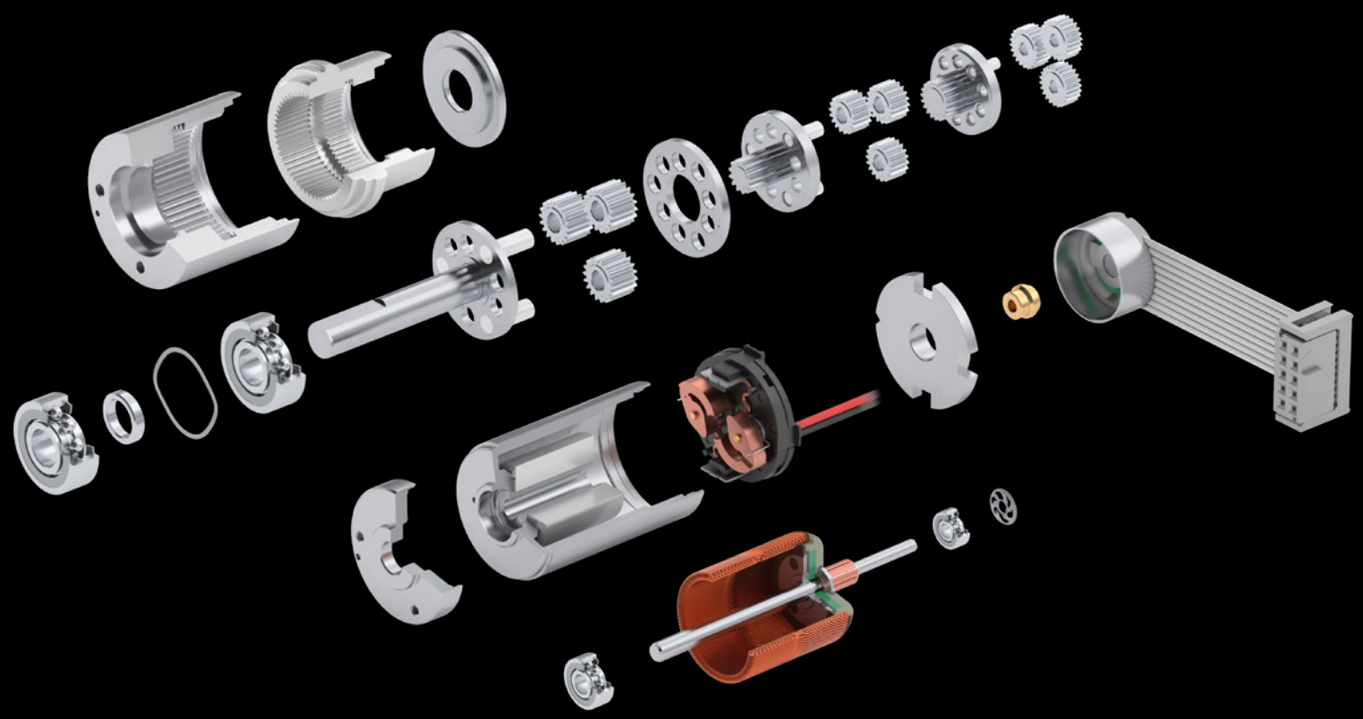
gear
screw drive

GP / GS	GP 6 A	Ø6 mm	0.002–0.03 Nm	3.9:1–854:1	358
	GP 8 A	Ø8 mm	0.01–0.1 Nm	4:1–4096:1	359
	GP 10 K	Ø10 mm	0.005–0.1 Nm	4:1–1024:1	360
	GP 10 A	Ø10 mm	0.01–0.15 Nm	4:1–1024:1	361
	GS 12 A	Ø12 mm	0.01–0.03 Nm	6.4:1–4402:1	362
	GP 13 K	Ø13 mm	0.05–0.15 Nm	4.1:1–1119:1	363
	GP 13 A	Ø13 mm	0.2–0.35 Nm	4.1:1–3373:1	364
	GS 16 K	Ø16 mm	0.01–0.03 Nm	6.4:1–5752:1	365
	GS 16 A	Ø16 mm	0.015–0.04 Nm	6.4:1–5752:1	366
	GS 16 V	Ø16 mm	0.06–0.1 Nm	6.4:1–5752:1	367
	GS 16 VZ	Ø16 mm	0.06–0.1 Nm	22:1–1670:1	368
	GP 16 A	Ø16 mm	0.1–0.3 Nm	4.4:1–4592:1	369
	GP 16 C	Ø16 mm	0.2–0.6 Nm	4.4:1–4592:1	370
	GP 19 B	Ø19 mm	0.1–0.3 Nm	4.4:1–4592:1	371
	GP 22 B	Ø22 mm	0.1–0.3 Nm	4.4:1–4592:1	372
	GP 22 L	Ø22 mm	0.2–0.6 Nm	3.8:1–4592:1	373
	GP 22 A	Ø22 mm	0.5–1.0 Nm	3.8:1–4592:1	374
	GP 22 AR	Ø22 mm	0.5 Nm	3.8:1–5.4:1	375
	GP 22 C	Ø22 mm	0.5–2.0 Nm	3.8:1–4592:1	376-377
	GP 22 HP	Ø22 mm	2.0–3.4 Nm	3.8:1–850:1	378
	GP 22 HD	Ø22 mm	2.0–4.0 Nm	3.8:1–4592:1	379
	GS 24 A	Ø24 mm	0.1 Nm	7.2:1–325:1	380
	GP 26 A	Ø26 mm	0.75–4.5 Nm	5.2:1–236:1	381
	GS 30 A	Ø30 mm	0.07–0.2 Nm	15:1–500:1	382
	GP 32 BZ	Ø32 mm	0.75–4.5 Nm	3.7:1–236:1	383
	GP 32 A	Ø32 mm	0.75–4.5 Nm	3.7:1–6285:1	384-385
	GP 32 AR	Ø32 mm	0.75 Nm	3.7:1–5.8:1	386
	GP 32 C	Ø32 mm	1.0–6.0 Nm	3.7:1–6285:1	387-389
	GP 32 CR	Ø32 mm	1.0 Nm	3.7:1–5.8:1	390
	GP 32 HP	Ø32 mm	4.0–8.0 Nm	14:1–913:1	391-392
	GP 32 HD	Ø32 mm	3.0–8.0 Nm	3.7:1–6285:1	393
	KD 32	Ø32 mm	1.0–4.5 Nm	11:1–1091:1	394
	GS 38 A	Ø38 mm	0.1–0.6 Nm	6:1–900:1	395
	GP 42 C	Ø42 mm	3.0–15.0 Nm	3.5:1–936:1	396-398
	GP 42 HD	Ø42 mm	10.0–50.0 Nm	3.5:1–676:1	399
	GS 45 A	Ø45 mm	0.5–2.0 Nm	5:1–1952:1	400
	GP 52 C	Ø52 mm	4.0–30.0 Nm	3.5:1–936:1	401-402
	GP 62 A	Ø62 mm	8.0–50.0 Nm	5.2:1–236:1	403
	GP 81 A	Ø81 mm	20.0–120.0 Nm	3.7:1–308:1	404
GPX	GPX 4	Ø4 mm	0.002–0.015 Nm	17:1–280:1	320
	GPX 6	Ø6 mm	0.002–0.03 Nm	3.9:1–854:1	321
	GPX 8	Ø8 mm	0.008–0.10 Nm	4:1–1296:1	322
	GPX 10	Ø10 mm	0.01–0.15 Nm	4:1–1024:1	323
	GPX 12	Ø12 mm	0.06–0.23 Nm	3.9:1–1526:1	324-325
	GPX 12 HP	Ø12 mm	0.25–0.35 Nm	16:1–1526:1	326
	GPX 13 SP	Ø13 mm	0.025–0.2 Nm	5:1–125:1	327
	GPX 14	Ø14 mm	0.13–0.4 Nm	3.9:1–1526:1	328-329
	GPX 14 HP	Ø14 mm	0.3–0.5 Nm	16:1–1526:1	330
	GPX 16	Ø16 mm	0.16–0.6 Nm	3.9:1–1526:1	331-332
	GPX 16 HP	Ø16 mm	0.55–0.9 Nm	16:1–1526:1	333
	GPX 16 SP	Ø16 mm	0.045–0.2 Nm	3.9:1–44:1	334
	GPX 19	Ø19 mm	0.28–1.05 Nm	3.9:1–1526:1	335-336
	GPX 19 HP	Ø19 mm	0.9–2.0 Nm	16:1–1526:1	337
	GPX 19 SP	Ø19 mm	0.08–0.36 Nm	3.9:1–44:1	338
	GPX 22	Ø22 mm	0.4–2.0 Nm	3.9:1–1526:1	339-340
	GPX 22 HP	Ø22 mm	2.4–3.7 Nm	16:1–1526:1	341
	GPX 22 UP	Ø22 mm	1.0–5.2 Nm	3.9:1–1526:1	342
	GPX 22 SP	Ø22 mm	0.11–0.55 Nm	3.9:1–44:1	343
	GPX 26	Ø26 mm	0.6–6.0 Nm	3.9:1–231:1	344-345
	GPX 26 HP	Ø26 mm	3.0–6.3 Nm	16:1–1526:1	346
	GPX 32	Ø32 mm	1.0–6.6 Nm	3.9:1–231:1	347-348
	GPX 32 HP	Ø32 mm	4.0–9.0 Nm	16:1–1526:1	349
	GPX 32 UP	Ø32 mm	2.2–12.6 Nm	3.9:1–1526:1	350
	GPX 37	Ø37 mm	1.85–9.3 Nm	3.9:1–231:1	351-352
	GPX 42	Ø42 mm	3.0–15.0 Nm	3.5:1–936:1	353
	GPX 42 UP	Ø42 mm	4.5–35.0 Nm	3.9:1–1135:1	353
	GPX 52	Ø52 mm	4.0–30.0 Nm	3.9:1–392:1	354-355
	GPX 52 UP	Ø52 mm	7.5–45.0 Nm	3.9:1–287:1	354
screw drive	GP 6 S	Ø6 mm	2–11 N	3.9:1–1024:1	407-408
	GP 8 S	Ø8 mm	3–27 N	4:1–1526:1	409-410
	GP 16 S	Ø16 mm	35–370 N	1:1–850:1	411-413
	GP 22 S	Ø22 mm	42–500 N	1:1–850:1	414-415
	GP 32 S	Ø32 mm	183–2700 N	1:1–1093:1	416-421



● Standard ○ Option/on request

Technology short and to the point



Here you can find short descriptions of the structure and technology of maxon products. Under "key information", you will find details about characteristics and diagrams, motor properties, motor selection, and many other important details.

maxon DC motor
Technology – short and to the point

The outstanding technical features of **maxon DC motors:**
- No magnetic cogging
- High acceleration thanks to a low mass inertia
- Low electromagnetic interference
- Low inductance
- High efficiency
- Linearity between voltage and speed
- Linearity between load and speed
- Linearity between load and current
- Small torque ripple thanks to multi-segment commutator
- Able to bear high overloads for short periods
- Compact design – small dimensions
- Multiple combination possibilities with gears as well as DC tachometers and encoders

Characteristics of the **maxon DCX** range:
- High power density
- High-quality DC motor with NdFeB magnet
- High speeds and torques
- Robust design (metal flange)
- Easily configured online
- Fast delivery

Characteristics of the **maxon DC-max** range:
- High-performance at low cost
- Combines rational manufacturing and design of the A-max motors with the higher power density of the NdFeB magnets
- Automated manufacturing process
- Easily configured online
- Fast delivery

Characteristics of the **maxon RE** range:
- High power density
- High-quality DC motor with NdFeB magnet
- High speeds and torques
- Robust design (metal flange)

Characteristics of the **maxon A-max** range:
- Good price-performance ratio
- DC motor with AlNiCo magnet
- Automated manufacturing process

Turning speed

The optimal operating speeds are between 4000 rpm and 9000 rpm depending on the motor size. Speeds of more than 20 000 rpm have been attained with some special versions.

A physical property of a DC motor is that, at a constant voltage, the speed is reduced with increasing loads. A good adaptation to the desired conditions is possible thanks to a variety of winding variants.

At lower speeds, a gear combination is often more favorable than a slowly turning motor.

Program

- **DCX**
- **DC-max**
- **RE**
- **A-max**

1	Flange
2	Permanent magnet
3	Housing (magnetic return)
4	Shaft
5	Winding
6	Commutator plate
7	Commutator
8	Graphite brushes
9	Precious metal brushes
10	Cover
11	Electrical connection
12	Ball bearing
13	Sintered sleeve bearing

The maxon winding

The “heart” of the maxon motor is the worldwide patented ironless winding, System maxon. This motor principle has very specific advantages. There is no magnetic detent and minimal electromagnetic interference. The efficiency of up to 90% exceeds that of other motor systems.

There are numerous winding variants for each motor type (see motor data sheets). They are differentiated by the wire diameter and number of turns. This results in various motor terminal resistances. The wire sizes used are between 32 µm and 0.45 mm, resulting in the different terminal resistances of the motors.
This influences the motor parameters that describe the transformation of electrical and mechanical energy (torque and speed constants). It allows you to select the motor that is best suited to your application.

Effects of wire gauge and number of windings are:

Low terminal resistance
- Low resistance winding
- Thick wire, few turns
- High starting currents
- High specific speed (rpm per volt)

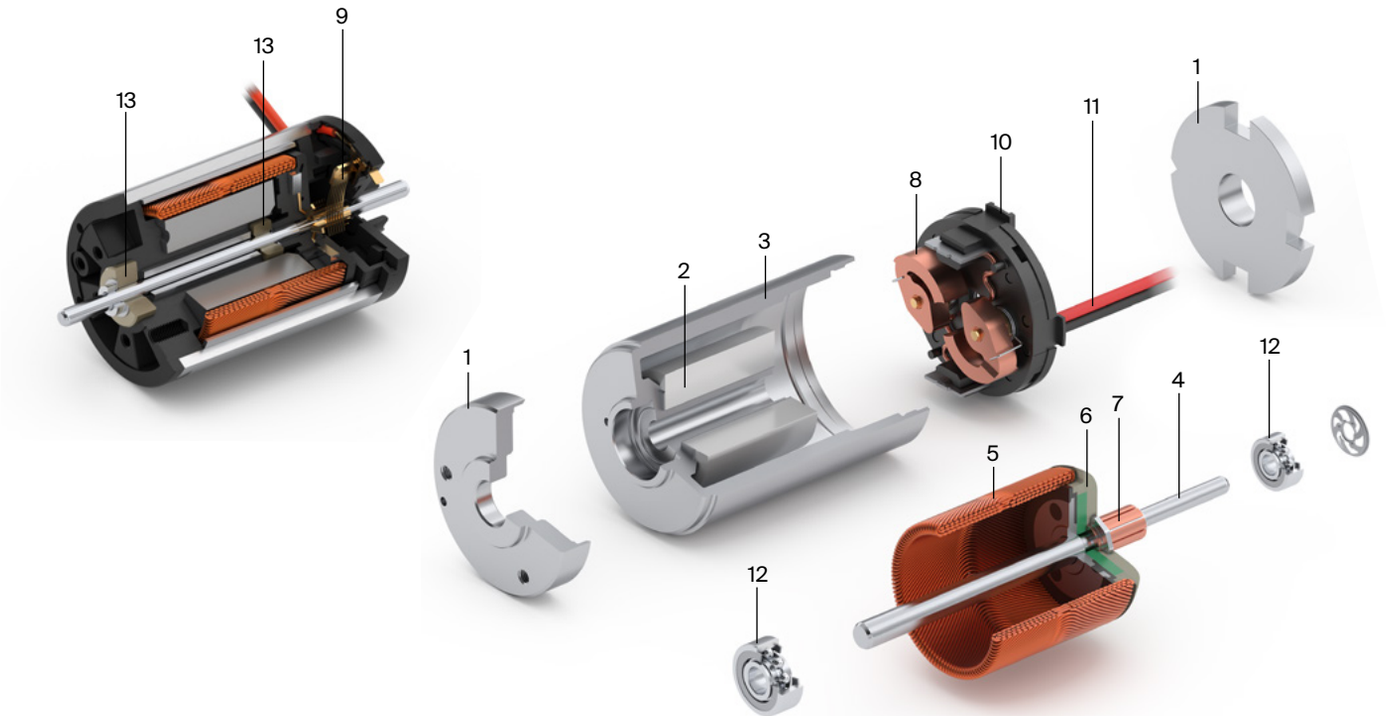
High terminal resistance
- High resistance winding
- Thin wire, many turns
- Low starting currents
- Low specific speed (rpm per volt)

The maximum permissible winding temperature in high-temperature applications is 125°C (155°C in special cases), otherwise 100°C or 85°C.

Service life

A general statement about service life cannot be made due to many influencing factors. Service life can vary between more than 20 000 hours under favorable conditions, and less than 100 hours under extreme conditions (in rare cases). Roughly 1000 to 3000 hours are attained with average requirements.

The following have an influence:
1. The electric load: higher current loads result in greater electric wear. Therefore, it may be advisable to select a somewhat stronger motor for certain applications. We would be happy to advise you.
2. Speed: the higher the speed, the greater the mechanical wear.
3. Type of operation: extreme start/stop, left/right operation leads to a reduction in service life.
4. Environmental influences: temperature, humidity, vibration, type of installation, etc.
5. In the case of precious metal brushes, **the CLL concept** increases service life at higher loads and the benefits of precious metal brushes are retained.
6. Combinations of **graphite brushes** and ball bearings lead to a long service life, even under extreme conditions.



Mechanical commutation

Graphite brushes
In combination with copper commutators for the most rigorous applications.
More than 10 million cycles were attained in different applications.

Graphite brushes are typically used:
- In larger motors
- With high current loads
- In start/stop operation
- In reverse operation
- While controlling at pulsed power stage (PWM)

The special properties of **graphite brushes** can cause so-called spikes. They are visible in the commutation pattern. Despite the high-frequency interference caused by the spikes, these motors have become popular in applications with electronic controls. Please note, that the contact resistance of the graphite brushes changes dependent on load.

Precious metal brushes and commutator
Our precious metal combinations ensure a highly constant and low contact resistance, even after a prolonged standstill time. The motors work with very low starting voltages and electromagnetic interferences.

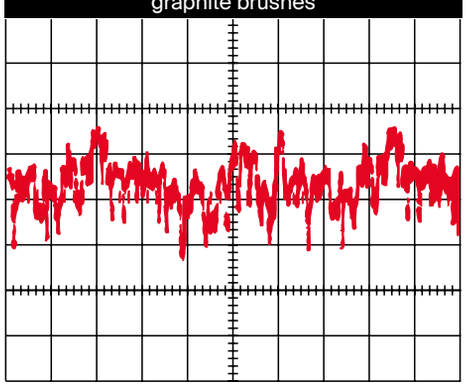
Precious metal brushes are typically used:
- In small motors
- In continuous operation
- With small current loads
- With battery operation
- In DC tachometers

The commutation pattern is uniform and free of spikes, as opposed to that of other motors. The combination of precious metal brushes and maxon rotor system results in minimum of high-frequency interference, which otherwise leads to major problems in electronical circuits. The motors need practically no interference suppression.

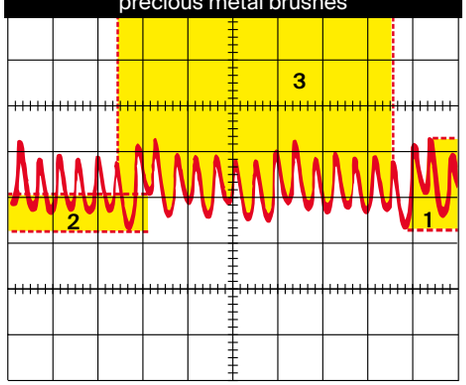
CLL concept
With precious metal commutation, the wear on commutators and brushes is caused mainly by sparks. The CLL concept suppresses spark generation to a large extent, thus greatly extending service life.
When driven with a pulsed power stage (PWM) higher no load currents occur and an unwanted motor heating can result. Additional inductance (chokes) in the motor supply lines help.

For further explanations, please see page 72 or “The selection of high-precision microdrives” by Dr. Urs Kafader.

Commutation pattern with graphite brushes



Commutation pattern with precious metal brushes



Commutation pattern
The commutation pattern shows the current pattern of a maxon DC motor over one motor revolution.
Please place a low-ohm series resistor in series with the motor (approx. 50 times smaller than the motor resistance). Observe the voltage drop over the resistor on the oscilloscope.

Legend
1 Ripple, actual peak-to-peak ripple
2 Modulation, attributable mainly to asymmetry in the magnetic field and in the winding.
3 Signal pattern within a revolution (number of peaks = twice the number of commutator segments)

maxon EC motor ironless winding
Technology – short and to the point

Characteristics of the **maxon EC motors** with ironless winding:
- Brushless DC motor (BLDC)
- Long service life
- Highly efficient
- Linear motor characteristics, excellent control properties
- Ironless winding system maxon with three phases in the stator
- Lowest electrical time constant and low inductance
- No detent
- Good heat dissipation, high overload capacity
- Rotating NdFeB permanent magnet with 1 or 2 pole pairs

Characteristics of the **maxon ECX SPEED** range:
- Power optimized, with high speeds up to 120 000 rpm
- Robust design
- Various types: e.g. short/long, sterilizable
- Lowest residual imbalance
- Easily configured online
- Fast delivery

Characteristics of the **maxon EC** range:
- Power optimized, with high speeds up to 50 000 rpm
- Robust design
- Lowest residual imbalance

Characteristics of the **maxon EC-max** range:
- attractive price-performance ratio
- robust steel casing
- speeds of up to 20 000 rpm
- rotor with 1 pole pair

Characteristics of the **maxon EC-4pole** range:
- Highest power density thanks to rotor with 2 pole pairs
- Knitted winding system maxon with optimised interconnection of the partial windings
- Speeds of up to 25 000 rpm
- High-quality magnetic return material to reduce eddy current losses
- Mechanical time constants below 3 ms
- Special version

Program

- **ECX SPEED**
- **EC**
- **EC-max**
- **EC-4pole**

- **with Hall sensors**
- **sensorless**
- **with integrated electronics**
- **sterilizable**
- **heavy duty**

1	Flange
2	Housing
3	Laminated steel stack
4	Winding
5	Permanent magnet
6	Shaft
7	Print with Hall sensors
8	Control magnet
9	Ball bearing

Electronical commutation

Block commutation
Rotor position is reported by three in-built Hall sensors. The Hall sensors arranged offset by 120° provide six different signal combinations per revolution. The three partial windings are now supplied in six different conducting phases in accordance with the sensor information. The current and voltage curves are block-shaped. The switching position of each electronic commutation is offset by 30° from the respective torque maximum.

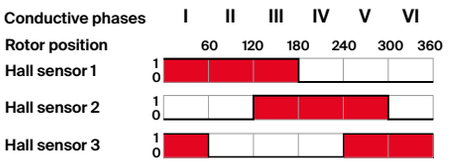
Properties of block commutation
- Relatively simple and favorably priced electronics
- Torque ripple of 14%
- Controlled motor start-up
- High starting torques and accelerations possible
- Servo drives, Start/stop operation
- Positioning tasks
- The data of the maxon EC motors are determined with block commutation.

Sensorless block commutation
The rotor position is determined using the progression of the induced voltage. The electronics evaluate the zero crossing of the induced voltage (EMF) and commute the motor current after a speed dependent pause (30°e after EMF zero crossing).
When stalled or at low speed, the voltage signal is too small and the zero crossing cannot be detected precisely. This is why special algorithms are required for starting (similar to stepper motor control).
To allow EC motors to be commuted without sensors in a Δ arrangement, a virtual star point is usually created in the electronics.

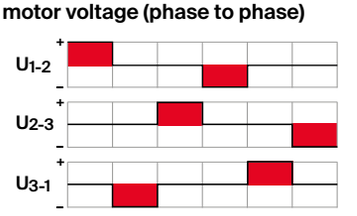
Properties of sensorless commutation
- Torque ripple of 14% (block commutation)
- No defined start-up
- Not suitable for low speeds and for dynamic applications
- Continuous operation at higher speeds (Fans, mills, drills)

Block commutation

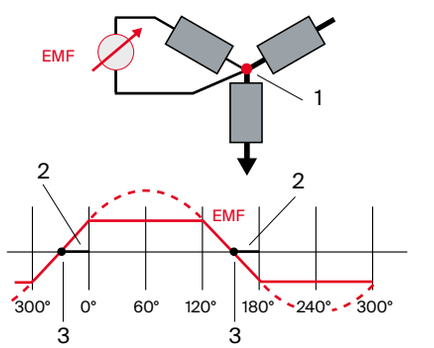
Signal sequence diagram for the Hall sensors



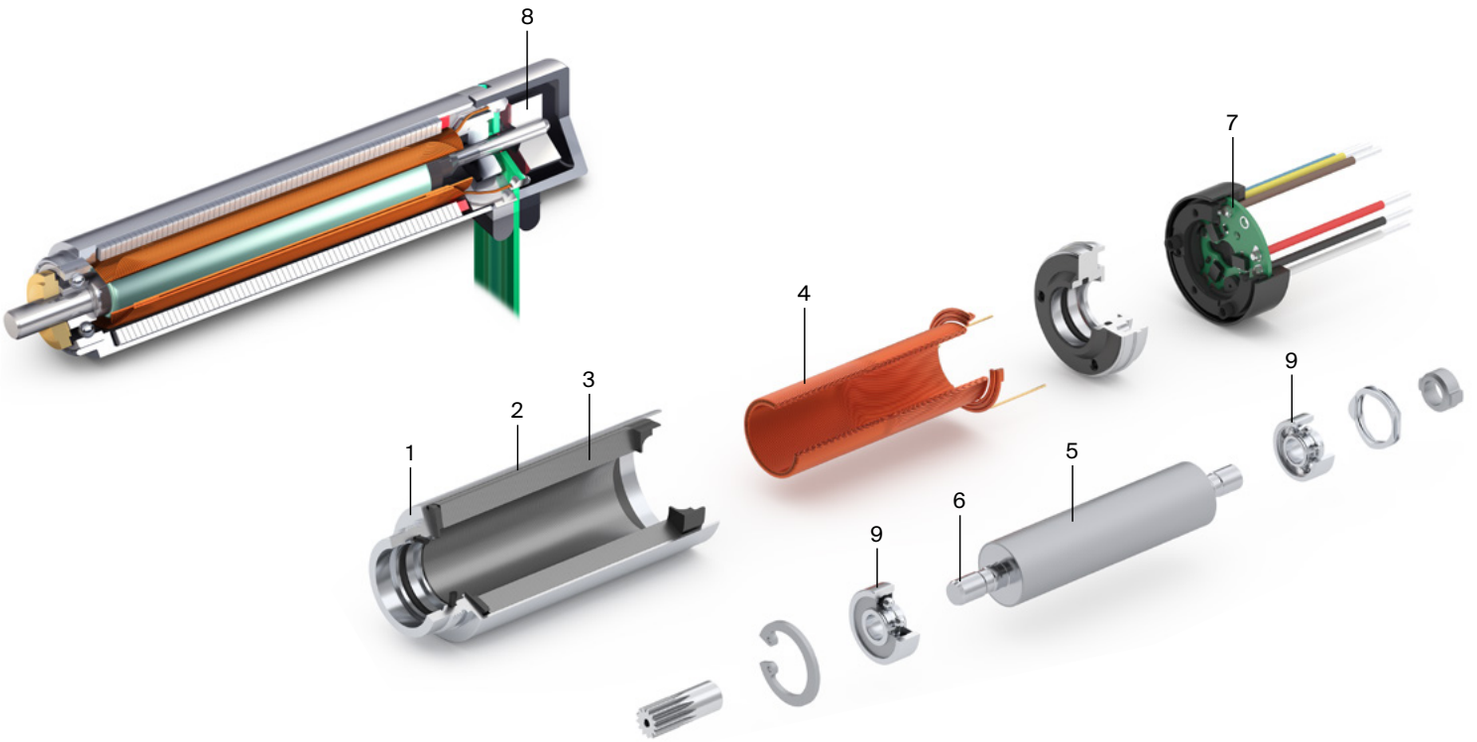
Supplied motor voltage (phase to phase)



Sensorless commutation



Legend
The commutation angle is based on the length of a full commutation sequence (360°e). The length of a commutation interval is therefore 60°e.
The commutation rotor position is identical to the motor shaft position for motors with 1 pole pair. The values of the shaft position are halved for motors with 2 pole pairs.



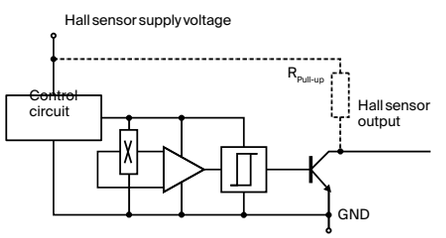
Sinusoidal commutation
The high resolution signals from the encoder or resolver are used for generating sine-shape motor currents in the electronics. The currents through the three motor windings are related to the rotor position and are shifted at each phase by 120° (sinusoidal commutation). This results in the very smooth, precise running of the motor and, in a very precise, high quality control.

Properties of sinusoidal commutation
- More expensive electronics
- Field-oriented control (FOC)
- No torque ripple
- Very smooth running, even at very low speeds
- Approx. 5% more continuous torque compared to block commutation
- Highly dynamic servo drives
- Positioning tasks

Hall sensor circuit

The open collector output of Hall sensors does not normally have its own pull-up resistance, as this is integral in maxon controllers. Any exceptions are specifically mentioned in the relevant motor data sheets.

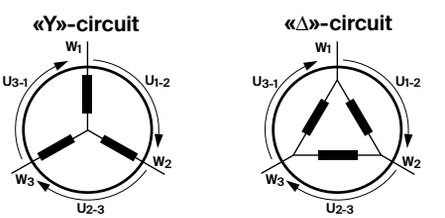
Wiring diagram for Hall sensors



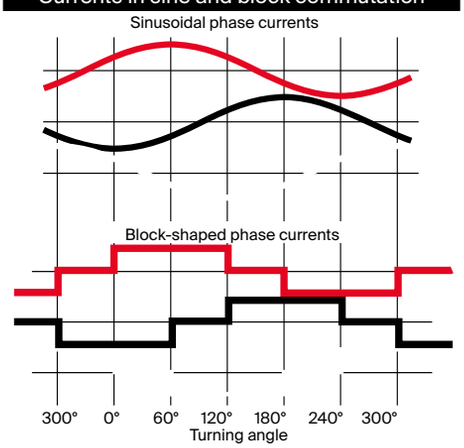
The power consumption of a Hall sensor is typically 4 mA (for output of Hall sensor = “HI”).

Winding arrangement

The maxon rhombic winding is divided into three partial windings, each shifted by 120°. The partial windings can be connected in two different manners - “Y” or “Δ”. This changes the speed and torque inversely proportional by the factor $\sqrt{3}$.
However, the winding arrangement does not play a decisive role in the selection of the motor. It is important that the motor-specific parameters (speed and torque constants) are in line with requirements.



Currents in sine and block commutation



Legend
1 Star point
2 Time delay 30°e
3 Zero crossing of EMF

Bearings and service life

The long service life of the brushless design can only be properly exploited by using pre-loaded ball bearings.
- Bearings designed for tens of thousands of hours
- Service life is affected by maximum speed, residual unbalance and bearing load

For further explanations, please see page 168 or “The selection of high-precision microdrives” by Dr. Urs Kafader.

maxon EC motor iron-cored winding
Technology – short and to the point

Characteristics of the **maxon EC motors** with iron winding:
- Brushless DC motor (BLDC)
- Long service life
- Comparatively high inertia
- Motor characteristics may vary from the strongly linear behaviour
- Hall sensor signals utilizable for simple speed and position control
- Multipole NdFeB permanent magnet
- Smaller commutation steps
- Winding with iron core and several teeth per phase in the stator
- Low detent torque
- Good heat dissipation, high overload capacity

Properties of the **maxon ECX TORQUE**-Programs:
- Highly dynamic due to internal, multipole rotor
- Mechanical time constants below one millisecond
- High torque density
- Easily configured online
- Fast delivery

Characteristics of the **maxon EC-i program:**
- Highly dynamic due to internal, multipole rotor
- Mechanical time constants below 3 ms
- High torque density
- Speeds of up to 15000 rpm

Characteristics of the **maxon EC-flat program:**
- Attractive price-performance ratio
- High torques due to external, multipole rotor
- Excellent heat dissipation at higher speeds thanks to open design
- Variants with open rotor or fan for even higher torques
- Flat design for when space is limited

In **EC frameless motor kits**, rotor and stator are delivered separately, without bearings and motor shaft. The motor is operational only when the two components are assembled.
- High torque grace to multi-pole motor design
- Installation instructions with detailed specification for optimum integration.
- Sensor for supervising the temperature (NTC hot conductor)
- Space-saving integration into the application

Legend
The commutation angle is based on the length of a full commutation sequence (360°e). The length of a commutation interval is therefore 60°e.
The values of the shaft position can be calculated from the commutation angle divided by the number of pole pairs.

Program

- **ECX TORQUE**
- **EC-i**
- **EC flat**
- **EC frameless**

- **with Hall sensors**
- **sensorless**
- **with integrated electronics**

1	Flange
2	Housing
3	Laminated steel stack
4	Winding
5	Permanent magnet
6	Shaft
7	Print with Hall sensors
8	Ball bearing
9	Spring (bearing preload)

Electronical commutation

Block commutation
Rotor position is reported by three built-in Hall sensors which deliver six different signal combinations per commutation sequence. The three phases are powered in six different conducting phases in line with this sensor information. The current and voltage curves are block-shaped. The switching position of every electronic commutation lies symmetrically around the respective torque maximum.

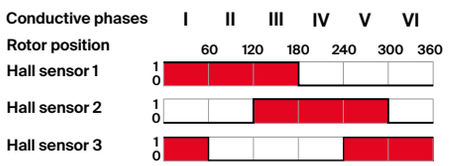
Properties of block commutation
- Relatively simple and favorably priced electronics
- Controlled motor start-up
- High starting torques and accelerations possible
- Servo drives, start/stop operation
- Positioning tasks
- The data of the maxon EC motors are determined with block commutation.

Sensorless block commutation
The rotor position is determined using the progression of the induced voltage. The electronics evaluate the zero crossing of the induced voltage (EMF) and commute the motor current after a speed dependent pause (30°e after EMF zero crossing).
When stalled or at low speed, the voltage signal is too small and the zero crossing cannot be detected precisely. This is why special algorithms are required for starting (similar to stepper motor control). To allow EC motors to be commuted without sensors in a Δ arrangement, a virtual star point is usually created in the electronics.

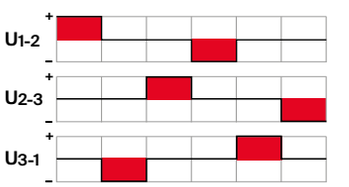
Properties of sensorless commutation
- No defined start-up
- Not suitable for low speeds and for dynamic applications
- Continuous operation at higher speeds (Fans, pumps)

Block commutation

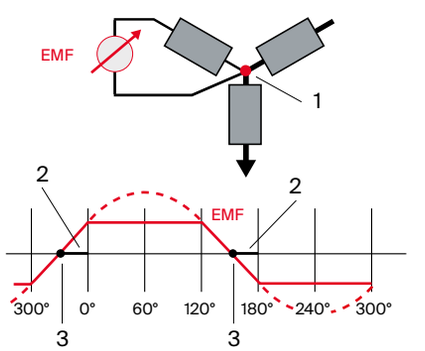
Signal sequence diagram for the Hall sensors

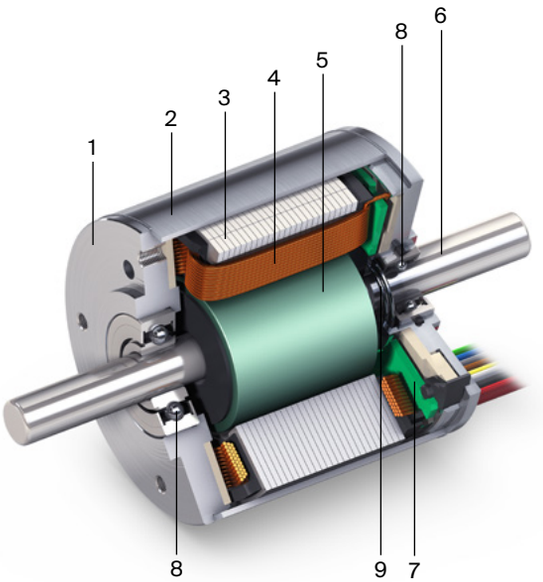


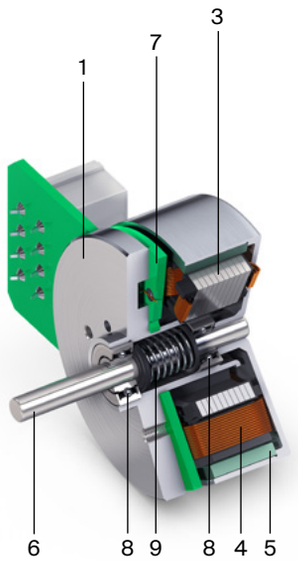
Supplied motor voltage (phase to phase)



Sensorless commutation





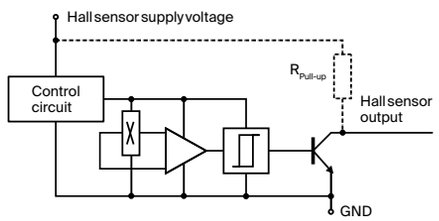


Sinusoidal commutation
Sinusoidal commutation or field-oriented control (FOC) for EC motors with grooved winding is possible. The main benefit of sinusoidal commutation – the smooth operation – only comes into play to a limited degree due to the detent.

Hall sensor circuit

The open collector output of Hall sensors does not normally have its own pull-up resistance, as this is integral in maxon controllers. Any exceptions are specifically mentioned in the relevant motor data sheets.

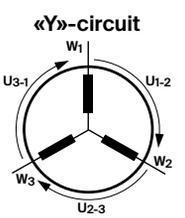
Wiring diagram for Hall sensors

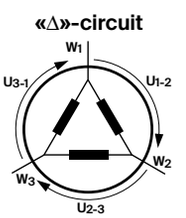


The power consumption of a Hall sensor is typically 4 mA (for output of Hall sensor = “HI”).

Winding arrangement

The winding is divided into 3 partial windings which have several stator teeth each. The partial windings can be connected in two different manners - “Y” or “Δ”. This changes the speed and torque inversely proportional by the factor $\sqrt{3}$.
However, the winding arrangement does not play a decisive role in the selection of the motor. It is important that the motor-specific parameters (speed and torque constants) are in line with requiremenats.





Bearings and service life

The long service life of the brushless design can only be properly exploited by using preloaded ball bearings.
– Bearings designed for tens of thousands of hours
– Service life is affected by maximum speed, residual imbalance and bearing load

For further explanations, please see page 168 or “The selection of high-precision microdrives” by Dr. Urs Kafader.

maxon compact drive
Technology – short and to the point

Properties of the brushless **maxon EC-max motors** with integrated electronics:
- Operated directly with DC voltage
- Integrated commutation electronics
- Ironless winding for good synchronization without cogging torque

Properties of the brushless **maxon EC-i motors** with integrated electronics:
- Can be operated directly with DC voltage
- Integrated commutation electronics with 4-Q speed control
- Separate set value input. Optionally with Enable or Direction input
- Speed monitor output
- Flat design with high torque

Properties of the brushless **maxon EC flat motors** with integrated electronics:
- Can be operated directly with DC voltage
- Integrated commutation electronics with 1-Q speed control (Hall sensor feedback)
- 2-wire version: Set value proportional to supply voltage
- 5-wire version: Separate set value input. Optionally with Enable or Direction input, speed monitor output
- Short design with high torque

Properties of the **maxon IDX drives:**
- Compact drive with integrated EPOS4 positioning/speed controller
- Field-oriented control
- Command via CANopen, EtherCAT or I/Os
- Integrated absolute encoder
- High power density
- IP65-protected design
- Optional holding brake and gearhead

Program

- **EC-max with integrated electronics**
- **EC-i with integrated electronics**
- **EC flat with integrated electronics**
- **IDX drives**

1	Gearhead (optional)
2	Motor
3	Holding brake (optional)
4	Encoder
5	Housing with connections
6	Electronics (EPOS 4)

Integrated electronics

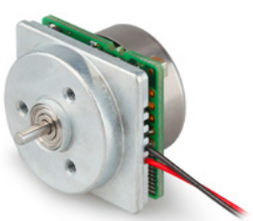
On motors with integrated electronics, the electronic commutation (usually block commutation with Hall sensors) is built in.
Usually speed control and other functionalities (activation, reversal of direction of rotation, speed monitor) are also implemented.

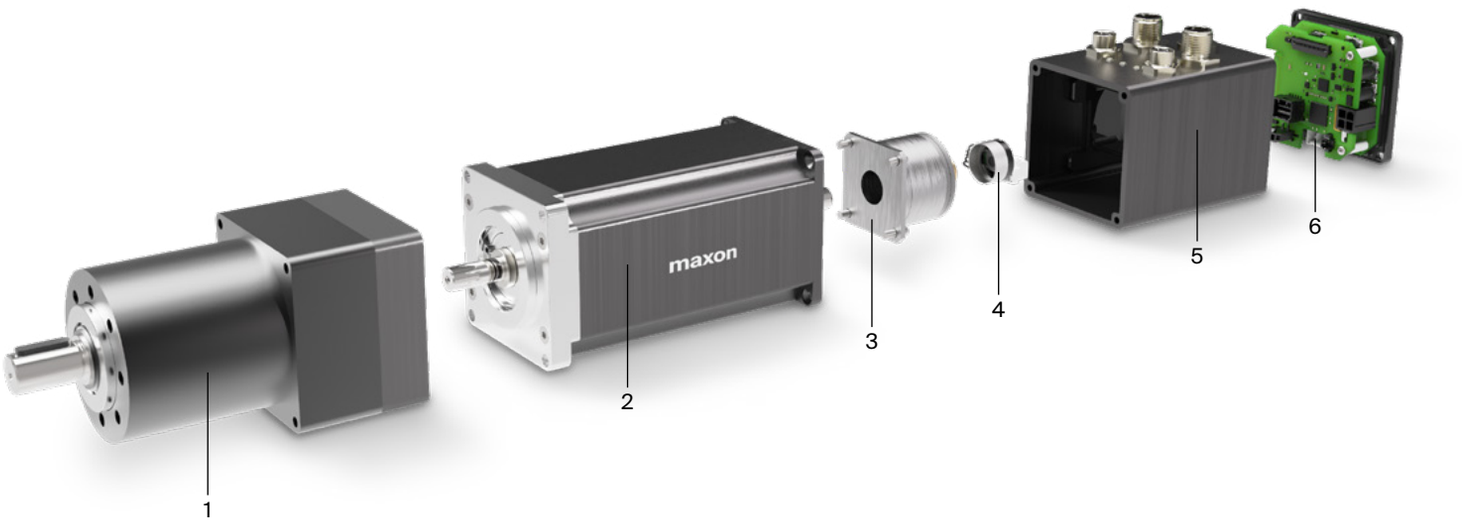
Properties
- Easy operation with DC voltage
- Fewer connections than EC motor
- No additional electronics required for commutation
- Possible power loss due to space constraints and the thermal coupling in the motor

EC-max 16

EC 20 flat

ECi 30 iE





IDX drives

The maxon IDX drives consist of a motor based on EC-i technology, a magnetic absolute encoder and an EPOS4 positioning controller with integrated field-oriented control (FOC).
- IP65 protection; only the output shaft needs to be sealed by the customer.
- Integrated temperature sensors on the winding and in the controller are evaluated directly in the drive and enable optimal utilization of the operating range.

EPOS4 positioning controller
The integrated EPOS4 enables different operating modes: Positioning, speed or current control. The drive can be commanded via EtherCAT or CANopen. The IDX drive is equipped with configurable digital and analog inputs and outputs. These are matched optimally to the various functions and operating modes of the CiA-402 device profile.
- Easy commissioning due to preconfigured motor, encoder and brake parameters, as well as auto-tuning function
- EPOS Studio: Intuitive software for commissioning
- Libraries for lean integration into a wide variety of master systems
- All documentation and software is available free of charge

Alternative version without fieldbus
(I/O version)
Commands are given via the inputs and outputs. In this case, only current and speed control are supported (no position control).

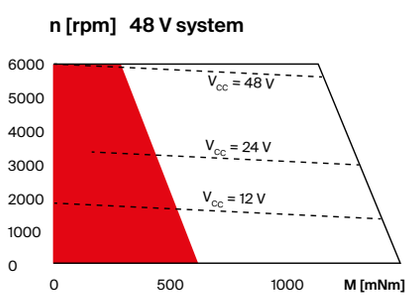
Optional brake
The holding brake blocks the motor when disconnected from power. The brake is controlled by the integrated controller.
- Minimally longer drive
- Holding brake, not suitable for deceleration.
- The brake influences the temperature range and the minimum permissible supply voltage
  The electrical properties, performance data, dimensional drawings and CAD data of the brake with drive are available online.

Cables
Only minimal work is needed for cabling the IDX drive, as only the power supply, command cabling and, if necessary, the I/Os have to be connected. In the online shop, maxon offers a selection of suitable cables.

Drive selection
maxon IDX drives are integrated systems that cannot be viewed and specified like separate motor-controller combinations. The supply current and supply voltage are not the currents and voltages that are present at the motor. For this reason, the data sheet does not specify motor characteristics, such as torque constant or speed constant.

For specification in an application, the nominal torque, the maximum torque (short-term), the nominal speed, as well as the maximum drive speed have to be referenced for the given supply voltage. The operating range diagrams can be useful for this.

At www.maxongroup.com, detailed documentation can be downloaded.



maxon gear
Technology – short and to the point

Gears

If mechanical power is required at a high torque and correspondingly reduced speed, a maxon precision gear is recommended. According to the gear ratio the output speed is reduced while the output torque is enhanced. For a more precise determination of the latter, efficiency must be taken into consideration.

Conversion
The conversion of speed and torque of the gear output *(n_L, M_L)* to the motor shaft *(n_{mot}, M_{mot})* follows the following equations:

$$n_{mot} = i \cdot n_L$$

$$M_{mot} = \frac{M_L}{i \cdot \eta}$$

where:
i: reduction
η: Gearhead efficiency

Program

- **GPX/GP (Planetary gearhead)**
- **GS (Spur gearhead)**
- **KD (Koaxdrive)**
- **GPS (Screw drives)**

1	Output shaft
2	Mounting flange
3	Bearing of the output shaft
4	Axial security
5	Intermediate plate
6	Cogwheel
7	Planetary gearwheel
8	Sun gearwheel
9	Planet carrier
10	Internal gear

Selection of gears

For the selection of the gearhead, the maximum transmittable power – the product of speed and torque – is decisive. It should be noted that the transmittable power depends on the number of gear stages.
The load torque should be below the nominal torque (max. continuous torque) of the gearhead $M_{N,G}$.

$$M_{N,G} \geq M_L$$

For short-term loading, the short-term torque of the gearhead must also be considered. Where possible, the input speed of the gear $n_{max,G}$ should not be exceeded. This limits the maximum possible reduction i_{max} at a given operating speed. The following applies to the selection of the reduction i

$$i \leq i_{max} = \frac{n_{max,G}}{n_L}$$

If the gear is selected, the data conversed to the motor axis (n_{mot}, M_{mot}) are used to select the motor. The maxon modular system defines the proper motor-gear combinations.

Service life

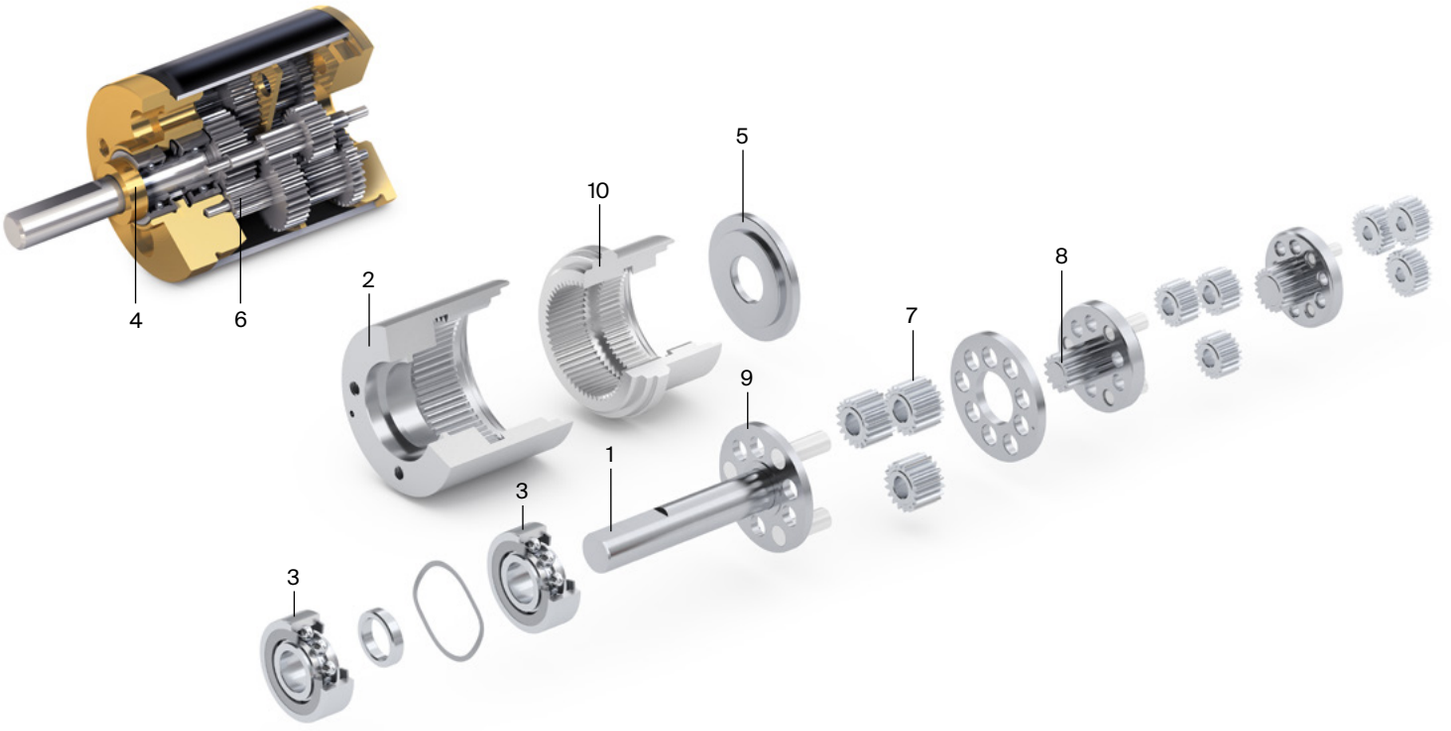
The gears usually achieve 1000 to 3000 operating hours in continuous operation at the maximum permissible load and recommended input speed. Service life is significantly extended if these limits are not pushed.
If the speed drops below this threshold, the gearhead may be loaded with higher torques without compromising the life span. On the other hand, higher speeds and thus higher reduction ratios can be chosen if the torque limits are not fully exploited.
Factors affecting life span include:
- Exceeding maximum torque can lead to excessive wear.
- Local temperature peaks in the area of tooth contact can destroy the lubricant.
- Massively exceeding the gear input speed reduces the service life.
- Radial and axial loads on the bearing.

Temperature/lubrication

maxon gears are lubricated for life. The lubricants used are especially effective in the recommended temperature range. At higher or lower operating temperatures we offer recommendations for special lubricants.

Spur gearhead

The gear consists of one or more stages. One stage represents the pairing of two cogwheels. The first cogwheel (pinion) is mounted directly on the motor shaft. The bearing of the output shaft is usually made of sintered material.
- Favorably priced
- For low torques
- Output torque up to 2 Nm
- Reduction ratios of 5:1 to 5752:1
- External – ∅12 – 45 mm
- Low noise level
- High efficiency



Planetary gearhead

Planetary gears are particularly suitable for the transfer of high torques. Large gearheads are normally fitted with ball bearings at gearhead output.
– For transferring high torques up to 180 Nm
– Reduction ratios of 4:1 to 6285:1
– External diameter 4–81 mm
– High performance in a small space
– High reduction ratio in a small space
– Concentric gear input and output

Plastic versions
Favorably priced and yet compact drives can be realized with plastic gears. The mechanical load is slightly smaller than that of metal designs, however, it is significantly higher than that of spur gears.

Ceramic versions
By using ceramic components in gearheads, the wear characteristics of critical components can be significantly improved. The result when compared to purely metal gearheads is:
– Longer service life
– Higher continuous torques
– Higher intermittent torques
– Higher input speeds

High power gearhead
Especially high output torques in the output stage of planetary gearheads can be achieved through the following measures
– Use of ceramic components
– 4 instead of 3 planet gears in the output stage
– Additional motor-side support of the output stage
– Reinforcement of the output bearings

Heavy duty gearhead
The HD (heavy duty) gearheads are characterized by their robust construction. The use of stainless steel and optimized welding joints enable use under the most extreme conditions.

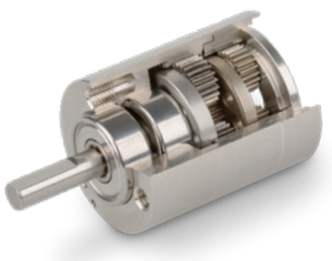
Reduced backlash gearhead
The reduction in backlash is achieved through a preloading of the planet gears in the output stage. Despite the wear that occurs during operation, the gearhead backlash remains constantly low, unlike for gearheads in which the backlash reduction is achieved by low-tolerance manufacturing and material pairing.

Sterilizable gearhead
Sterilizable gearheads are characterized by the use of stainless steel and special lubricants. The bearing of the output shaft and the connection to the motor are designed so that fluid leaking into the gearhead is inhibited.

Koaxdrive

Noise reduction
Noise is primarily generated in the input stage of the gearhead. The following measures can help to reduce noise:
– Smaller input speeds and thus smaller relative velocity of the tooth flanks
– Input stage with plastic gears
– Use of a Koaxdrive gearhead

The quiet “Koaxdrive” combines worm and planetary gearing. In the first stage, a separately mounted worm drives the three offset planetary wheels which then mesh in the specially toothed internal geared wheel. All further stages are designed as a normal planetary gear:
– low noise
– high reduction ratio in the first stage
– other properties as planetary gears



maxon sensor
Technology – short and to the point

Encoder

maxon offers a range of different encoders. Their main characteristics are:

Digital incremental encoders
- Relative position signal, suitable for positioning tasks
- Direction of rotation detection
- Speed information from number of pulses per unit of time
- Standard solution for many applications

Digital absolute encoders
- Absolute single-turn position signal, suitable for absolute positioning within one motor revolution
- Solution for special applications without homing procedure
- Option to generate commutation signals

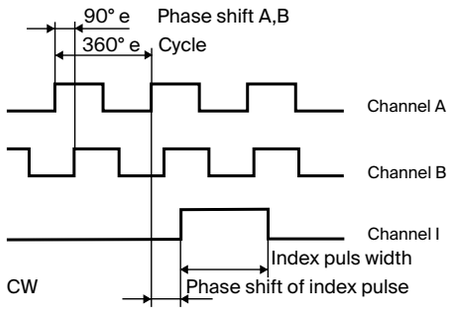
DC tacho
- Analog speed signal
- Direction of rotation detection
- Not suited for positioning tasks

Resolver
- Analog signal transmission
- More complex evaluation electronics required in controller
- For special industrial solutions

Encoder signals

Digital incremental encoders
Position changes (relative position) are transmitted to the controller as square pulses. The controller evaluates these pulses for precise positioning or speed measurement. The signal transmission is implemented via two phase-shifted channels (A and B) that are compared to determine the direction of rotation. Usually the phasing of channels A and B applies for operation in a clockwise direction (CW), relative to the motor shaft seen from the outside.
The maxon controllers evaluate the signal edges. This results in a four times higher positioning resolution relative to the counts per turn of the encoder. The technical term for this is quad counts or states. The absolute position can be determined by homing to a fixed position. The signal edges of index channel I can be used for a precise reference position.

Representation of the output signal of a digital encoder



Program

- **MILE (inductive encoders)**
- **EASY, MAG, MR, MEnc (magnetic encoders)**
- **Enc, HEDS, HEDL, AEDL, RIO (optical encoders)**
- **DC-Tacho, Res (analog sensors)**

The line driver is a driver built into the encoder to improve the signal quality through steeper edges. Additionally, it generates the complementary signals $\overline{A}$, $\overline{B}$, and $\overline{I}$. Differential signals make it possible to eliminate faults during transmission.

Absolute encoders
Absolute encoders return the absolute position as a bit sequence for transmission with a suitable protocol (SSI, BiSS-C) at the clock rate of the controller. The resolution given as a bit length; e.g. 12-bit equals 4096 positions. Single-turn absolute encoders output the position only within one motor revolution. Multi-turn absolute encoders determine the position unambiguously over several revolutions. They frequently have the capability to detect motor revolutions even without a power supply. At start-up, the motor position is determined over multiple revolutions.

Recommendations on encoder selection

(✓) Conditionally applicable *OPT, ENC, AEDL, HEDL, HEDS		QUAD	MEnc	MR	EASY	MILE	optical*	RIO
1	very high speed	✓	✓	✓	✓	(✓)		✓
2	very low speed			(✓)	(✓)	✓	✓	✓
3	precise position			(✓)	(✓)	(✓)	✓	✓
4	line driver possible			✓	✓	✓	✓	✓
5	index channel possible			✓	✓		✓	✓
6	compact design	✓	(✓)	✓	✓	✓		✓
7	dust, dirt, oil	✓	✓	✓	✓	✓		(✓)
8	external magnetic fields	(✓)	(✓)		(✓)	✓	✓	✓
9	ionising radiation		✓					

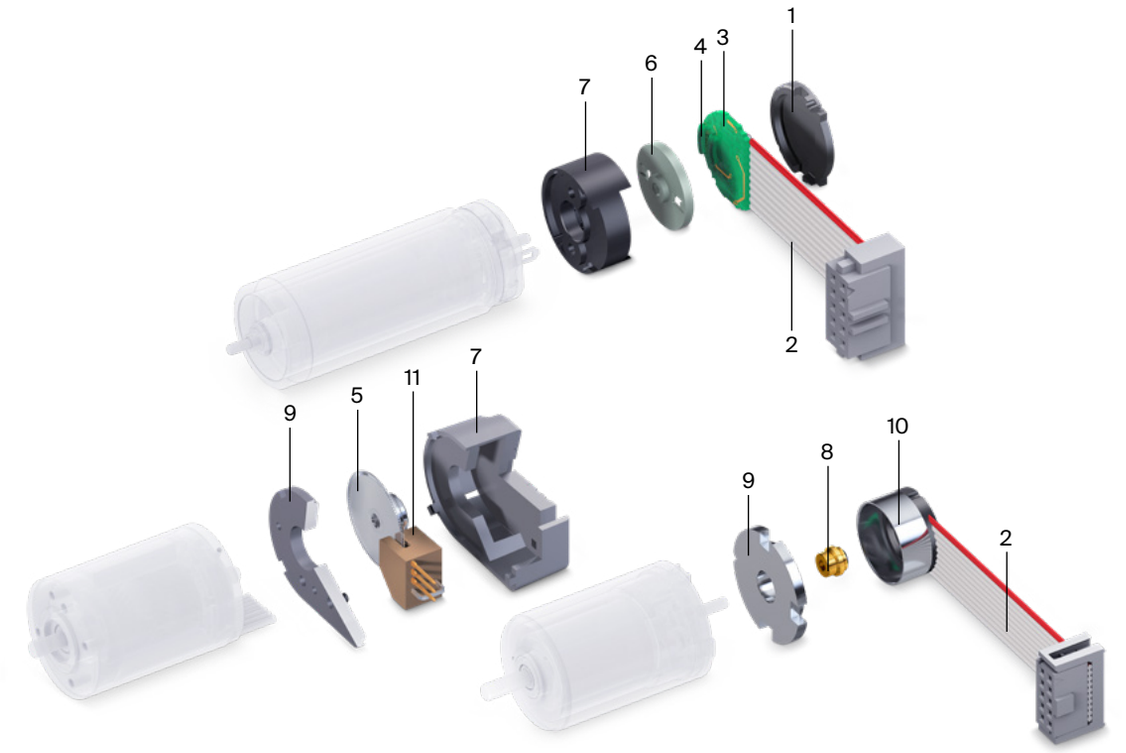
1 End cap
2 Electrical connections motor and encoder
3 PCB
4 MR sensor
5 Graduated disk
6 Magnetic multi-pole wheel
7 Encoder housing
8 Solid measure
9 Flange
10 Sensor with housing
11 Encoder fork coupler

Key points for encoder selection

These are the main characteristics of maxon incremental encoders:
- Counts per turn (increments)
- Accuracy
- Use of an index channel
- Use of a line driver
- Maximum supported speed
- Suitability for special ambient conditions (dust, oil, magnetic fields, ionizing radiation)

Encoders and maxon controllers
- The input frequency of the control electronics may limit the maximum possible counts per turn of the encoder.
- The higher the counts per turn and the accuracy, the easier it is to achieve a smooth, jolt-free operation even at low speeds.
- maxon controllers can be adjusted for operation at low or high speeds, as well as for encoders with low or high counts per turn.

For positioning systems, the following applies:
- The higher the counts per turn, the more accurate the positioning. For 500 counts (2000 quad counts), a mechanical angle resolution of 0.18° is achieved. This is usually much higher than the precision of the mechanical drive components (e.g. due to gear backlash or the elasticity of drive belts).
- In positioning controllers, only encoders with an integrated line driver should be used (e.g. RS422). This prevents signal loss and accumulated positioning errors due to electromagnetic interference.
- Positioning applications often required the encoder's index channel for precise determination of a reference point.



Magnetic encoders

In magnetic encoders, a small permanent magnet is installed on the spinning motor shaft. Sensors in the stator capture the changes in the magnetic flux. The signals are evaluated in the encoder and transmitted to the controller as pulses or as an absolute signal. Magnetic encoders are typically very small and resilient to dirt.

EASY and MAG encoders
- Integrated circuit based on Hall sensors and interpolator
- EASY incremental: Factory programmable resolution from 1 to 1024 counts per turn, with index channel and line driver
- EASY absolute: Single-turn with 4096 states (12-bit) and Biss-C or SSI interface
- MAG incremental: Various resolutions available (up to 256 counts per turn); recommended for battery operation

MR encoder (incremental)
- Magneto-resistive Sensor with/without interpolator
- Various resolutions available (up to 1024 counts per turn)
- With/Without index channel and/or line driver

MEnc and QUAD encoder (incremental)
- Digital Hall sensors without interpolation
- Line driver not available
- MEnc: 12 or 16 counts per turn
- QUAD: 1 count per turn (4 states)

Optical encoders

In optical encoders, an LED emits light through a finely structured code wheel (HEDL, AEDL, HEDS, Enc22) or directed at a structured reflector (RIO) attached to the motor shaft. The receiver converts the light/dark signals into electrical currents, which are amplified and turned into electrical pulses by the respective electronics. Optical encoders typically have a high resolution and high accuracy.

RIO encoder
- Reflective interpolated optical encoder
- Very high resolution (typically 4096 to 16,384 counts per turn), programmable at the factory
- With index channel and RS422 line driver
- Very small size

Encoder attachment AEDL, HEDL, HEDS
- Transmissive optical encoders
- Up to 5000 counts per turn (AEDL)
- With line driver RS422 (AEDL, HEDL)
- Relatively large size

Inductive encoder

With inductive MILE encoders, a high-frequency alternating field is transmitted via transformer while being modulated angle-dependently using a structured copper disk.

Characteristics
- Highly resistant to magnetic and electrical fields as well as soiling.
- High speeds possible
- High accuracy
- Line driver (can be acc. to RS422)

DC tacho

In principle, any maxon DC motor can be used as a DC tacho. For motor-tacho combinations, we offer a DC tacho that has the tacho rotor mounted directly on the motor shaft.

Characteristics
- Output DC voltage proportional to the speed due to precious metal brushes
- AlNiCo magnet for high signal stability even with temperature fluctuations
- Without additional tacho bearing; no added friction torque
- No couplings, high mechanical resonant frequency

Resolver

The resolver is attached to the continuous shaft of the motor and aligned perfectly with the rotor's magnetic field.
A high-frequency alternating voltage (10 kHz) is transmitted to the rotor via a transformer. During retransformation on two stator coils, the signal is modulated with the sine/cosine of the rotation angle. This makes it possible to derive the position of the rotor.

Characteristics
- Robust, for industrial use
- Long service life
- No mechanical wear
- Interference-free signal transmission over long distances
- No sensitive electronics
- Special signal evaluation required
- Only one encoder for position and speed information
- EC motors with resolvers are delivered without Hall sensors

maxon motor control
Technology – short and to the point

Controllers

The **maxon motor control** program contains servo amplifiers for controlling the fast reacting maxon DC and EC motors.
Special characteristics:
– built-in additional inductance for operation with low-inductance motors.
– high PWM frequencies (>50 kHz)
– high efficiency

The **zub machine controllers** are programmable master controllers for sophisticated multi-axis systems
– EtherCAT and/or CANopen master (and/or slave)
– Highly dynamic drive synchronization
– Curve interpolation (camming)

Program

– **DEC module: 1-Q speed controller (closed loop) for brushless (maxon EC) motors**
– **ESCON: 4-Q speed and current controller for DC and EC motors**
– **EPOS: Position controller for DC and EC motors**
– **MACS5, MiniMACS, MasterMACS: Programmable multi-axis masters**

Motor type
– maxon DC motor – maxon EC motor with or without sensor
Control variables
– Speed – Position – Current
Feedback
– Encoder – DC Tacho – IxR compensation – Hall sensors
Set value specification
– Analog voltage – Digitally via field bus

Set value specification

Servo controllers (speed and current controllers) are usually designed for analog specification of set values. Alternatively, PWM signals or fixed set values are also possible.

maxon positioning controllers (EPOS) require a higher-level master, which takes care of process control and sends individual commands to the positioning controller and to other slave modules in the system via the bus system (RS232, USB, CANopen, EtherCAT). Typically, the master reads the parameters of the slave modules (e.g., the current position or the status of an input), and uses them to generate new commands (e.g., a new target position or setting of an output). The master runs an application specific program.

Possible master systems
– zub motion control
– PLC
– Microcontroller
– PC

CANopen

EtherCAT

USB

RS232

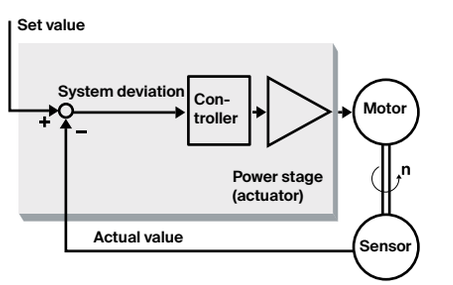
Controlled variables

Speed control
The function of the speed servo amplifier is to keep the prescribed motor speed constant and independent of load changes. To achieve this, the set value (desired speed) is continuously compared with the actual value (actual speed) in the control electronics of the servo amplifier. The controller regulates the power stage of the servo amplifier to eliminate this difference as much as possible. The control loop is closed.

Position control
The position controller ensures that the currently measured position matches a set position, by sending appropriate correction values to the power stage, just like the speed controller. The required position information is usually received from a digital encoder.

Current control
The current control provides the motor with a current proportional to the set value. Accordingly, the motor torque changes proportionally to the set value. The current controller improves the dynamics of a higher-level position or speed control loop.

Principle of a control circuit



Feedback sensors

Digital encoder control
The motor is equipped with a digital encoder that provides a certain number of pulses per revolution. Incremental or absolute encoders can be used (cf. p. 54: Encoder signals).
– Digital encoders are often found in positioning controls, in order to derive and measure the travel or angle.
– Digital encoders are not subject to mechanical wear.
– If an EC motor's Hall sensor signals are used for control, then the result is similar to using an incremental encoder with a low resolution.

DC tacho control
The motor must be equipped with a DC tacho-meter that provides a speed proportional signal. In the maxon modular system, the tachometer rotor is mounted directly on the through motor shaft, resulting in a high resonant frequency.
– Limited service life of the DC tacho generator
– For speed control only
– Analog feedback signal

IxR compensation
The motor is provided with a voltage that is proportional to the applied speed set value. The speed would drop with increasing motor load. The compensation circuitry increases the output voltage with increasing motor current. The compensation must be adjusted to the terminal resistance of the motor which depends on temperature and load.

The attainable speed precision of such a system is subject to limits in the percent range.
– Favorably priced and space-saving
– No tacho-generator or encoder required
– Only analog speed control possible
– Less precise control when there is a load change
– Ideal for low-cost applications without high demands on speed accuracy

Control concepts

Traditional PI or PID controllers often additionally use a feed forward that is proportional to speed and acceleration in order to compensate for friction and inertia.

More sophisticated control concepts may also be used on a case-by-case basis. These include
– Observer-supported control
– Sensorless control through evaluation of motor parameters (EMF, impedance)
– Dual loop control for load-side control with compensation of backlash and elasticity
– Gain scheduling

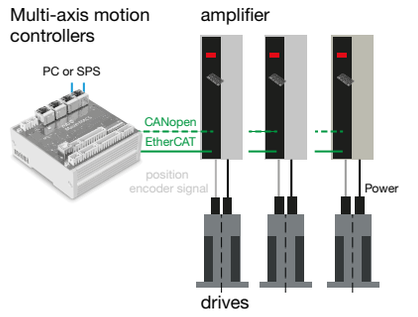
One key aspect for users is automatic controller tuning, which is available as standard for all maxon motor control products and ensures optimum system adjustment.

Multi-axis motion controllers

Multi-axis motion controllers are freely programmable controllers that make it possible to easily synchronize coordinated movements of several axes. Powerful commands are provided, for example for completing the following tasks (among others)

– PLC functionality as a sequential program (cyclical processing) or as state machines that work in parallel
– Coordinated time or path-synchronous multi-axis positioning
– Synchronous execution of CAM profiles (cam disks) on several axes
– Control of freely definable path trajectories with different kinematics (X-Y tables, 3D plotters, Scara robots, Delta robots...)
– Master-slave synchronization of several axes with marker comparison.

Principle: Multi-axis motion controllers



maxon DC motor and maxon EC motor
Key information

The motor as an energy converter

The electrical motor converts electrical power P_{el} (current I_{mot} and voltage U_{mot}) into mechanical power P_{mech} (speed n and torque M). The losses that arise are divided into frictional losses, attributable to P_{mech} and in Joule power losses P_J of the winding (resistance R). Iron losses do not occur in the coreless maxon DC motors. In maxon EC motors, they are treated formally like an additional friction torque. The power balance can therefore be formulated as:

$$P_{el} = P_{mech} + P_J$$

The detailed result is as follows

$$U_{mot} \cdot I_{mot} = \frac{\pi}{30\,000} n \cdot M + R \cdot I_{mot}^2$$

Electromechanical motor constants
The geometric arrangement of the magnetic circuit and winding defines in detail how the motor converts the electrical input power (current, voltage) into mechanical output power (speed, torque). Two important characteristic values of this energy conversion are the speed constant k_n and the torque constant k_M. The speed constant combines the speed n with the voltage induced in the winding U_{ind} (= EMF). U_{ind} is proportional to the speed; the following applies:

$$n = k_n \cdot U_{ind}$$

Similarly, the torque constant links the mechanical torque M with the electrical current I_{mot}.

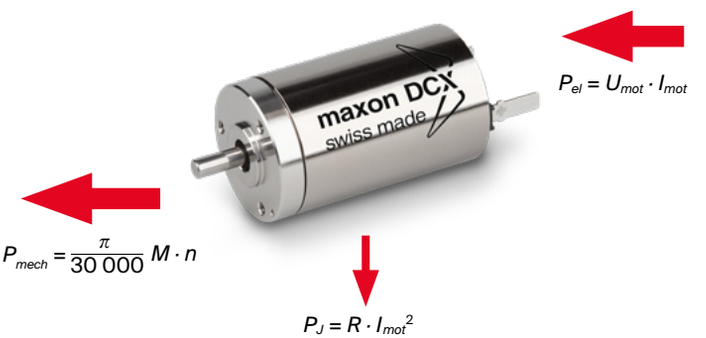
$$M = k_M \cdot I_{mot}$$

The main point of this proportionality is that torque and current are equivalent for the maxon motor.
The current axis in the motor diagrams is therefore shown as parallel to the torque axis as well.

See also: explanation of the motor

Units
In all formulas, the variables are to be used in the units according to the catalog (cf. physical variables and their units on page 64).

The following applies in particular:
– All torques in mNm
– All currents in A (even no load currents)
– Speeds (rpm) instead of angular velocity (rad/s)



Motor constants
Speed constant k_n and torque constant k_M are not independent of one another. The following applies:

$$k_n \cdot k_M = \frac{30\,000}{\pi}$$

The speed constant is also called specific speed. Specific voltage, generator or voltage constants are mainly the reciprocal value of the speed constant and describe the voltage induced in the motor per speed. The torque constant is also called specific torque. The reciprocal value is called specific current or current constant.

Motor diagrams

A diagram can be drawn for every maxon DC and EC motor, from which key motor data can be taken. Although tolerances and temperature influences are not taken into consideration, the values are sufficient for a first estimation in most applications. In the diagram, speed n, current I_{mot}, power output P_2 and efficiency η are applied as a function of torque M at constant voltage U_{mot}.

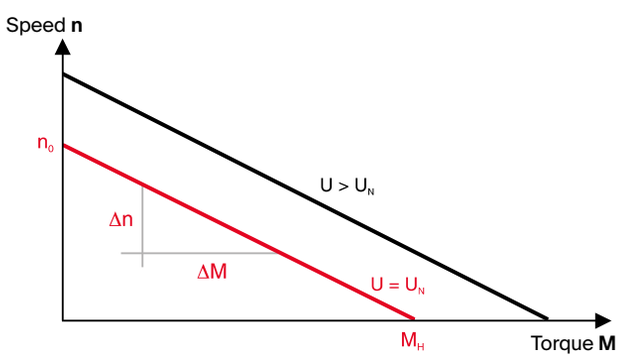
Speed-torque line
This curve describes the mechanical behavior of the motor at a constant voltage U_{mot}:
– Speed decreases linearly with increasing torque.
– The faster the motor turns, the less torque it can provide.
The curve can be described with the help of the two end points, no load speed n_0 and stall torque M_H (cf. lines 2 and 7 in the motor data).
DC motors can be operated at any voltage. No load speed and stall torque change proportionally to the applied voltage. This is equivalent to a parallel shift of the speed-torque line in the diagram. Between the no load speed and voltage, the following proportionality applies in good approximation

$$n_0 \approx k_n \cdot U_{mot}$$

where k_n is the speed constant (line 13 of the motor data).

Independent of the voltage, the speed-torque line is described most practically by the slope or gradient of the curve (line 14 of the motor data).

$$\frac{\Delta n}{\Delta M} = \frac{n_0}{M_H}$$



Derivation of the speed-torque line
The following occurs if one replaces current I_{mot} with torque M using the torque constant in the detailed power balance:

$$U_{mot} \cdot \frac{M}{k_M} = \frac{\pi}{30\,000} n \cdot M + R \cdot \left(\frac{M}{k_M}\right)^2$$

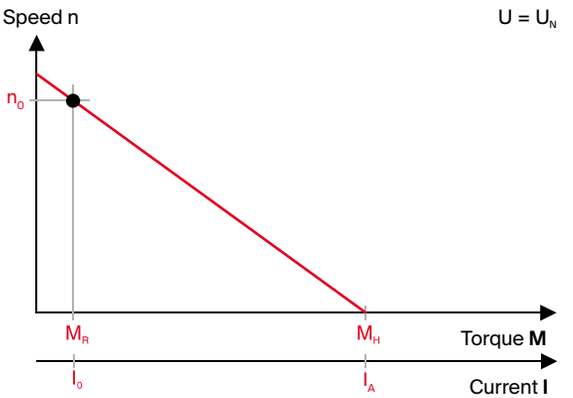
Transformed and taking account of the close relationship of k_M and k_n, an equation is produced of a straight line between speed n and torque M.

$$n = k_n \cdot U_{mot} - \frac{30\,000}{\pi} \cdot \frac{R}{k_M^2} \cdot M$$

or with the gradient and the no load speed n_0

$$n = n_0 - \frac{\Delta n}{\Delta M} \cdot M$$

The speed-torque gradient is one of the most informative pieces of data and allows direct comparison between different motors. The smaller the speed-torque gradient, the less sensitive the speed reacts to torque (load) changes and the stronger the motor. With the maxon motor, the speed-torque gradient within the winding series of a motor type (i.e. on one catalog page) remains practically constant.



Current gradient
The equivalence of current to torque is shown by an axis parallel to the torque: more current flowing through the motor produces more torque. The current scale is determined by the two points no load current I_0 and starting current I_A (lines 3 and 8 of motor data).
The no load current is equivalent to the friction torque M_R, that describes the internal friction in the bearings and commutation system.

$M_R = k_M \cdot I_0$

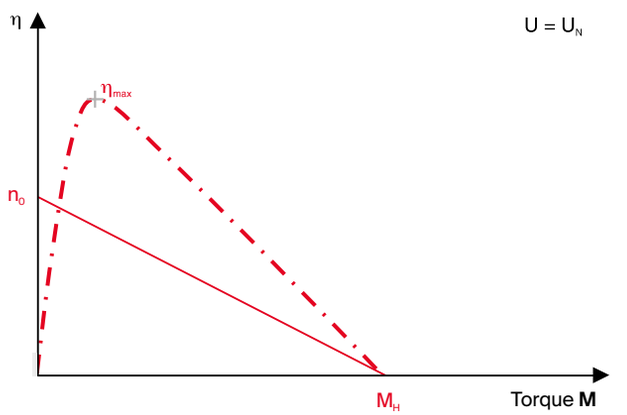
In the maxon EC motor, there are strong, speed dependent iron losses in the stator iron stack instead of friction losses in the commutation system.

The motors develop the highest torque when starting. It is many times greater than the normal operating torque, so the current uptake is the greatest as well.
The following applies for the stall torque M_H and starting current I_A

$M_H = k_M \cdot I_A$

Efficiency curve
The efficiency η describes the relationship of mechanical power delivered to electrical power consumed.

$$\eta = \frac{\pi}{30\,000} \cdot \frac{n \cdot (M - M_R)}{U_{mot} \cdot I_{mot}}$$



One can see that at constant applied voltage U and due to the proportionality of torque and current, the efficiency increases with increasing speed (decreasing torque). At low torques, friction losses become increasingly significant and efficiency rapidly approaches zero. Maximum efficiency (line 9 of motor data) is calculated using the starting current and no load current and is dependent on voltage.

$$\eta_{max} = \left(1 - \sqrt{\frac{I_0}{I_A}}\right)^2$$

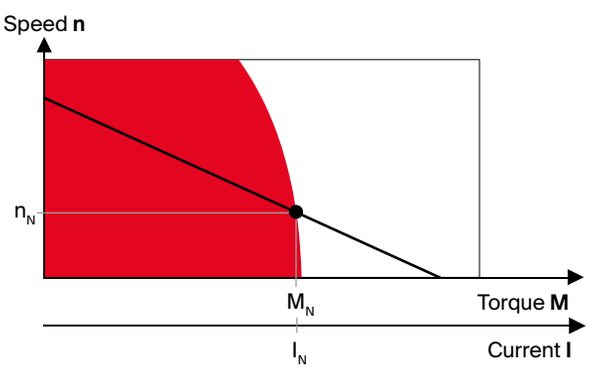
Maximum efficiency and maximum output power do not occur at the same torque.

Rated operating point

The rated operating point is an ideal operating point for the motor and derives from operation at nominal voltage U_N (line 1 of motor data) and nominal current I_N (line 6). The nominal torque M_N produced (line 5) in this operating point follows from the equivalence of torque and current.

$M_N \approx k_M \cdot (I_N - I_0)$

Nominal speed n_N (line 4) is reached in line with the speed gradient. The choice of nominal voltage follows from considerations of where the maximum no load speed should be. The nominal current derives from the motor's thermally maximum permissible continuous current.



Motor diagrams, operating ranges

The catalog contains a diagram of every maxon DC and EC motor type that shows the operating ranges of the different winding types using a typical motor.

Permanent operating range
The two criteria “maximum continuous torque” and “maximum permissible speed” limit the continuous operating range. Operating points within this range are not critical thermally and do not generally cause increased wear of the commutation system.

Short-term operating range
The motor may only be loaded with the maximum continuous current for thermal reasons. However, temporary higher currents (torques) are allowed. As long as the winding temperature is below the critical value, the winding will not be damaged. Phases with increased currents are time limited. A measure of how long the temporary overload can last is provided by the thermal time constant of the winding (line 19 of the motor data). The magnitude of the times with overload ranges from several seconds for the smallest motors (6 mm to 13 mm diameter) up to roughly one minute for the largest (60 mm to 90 mm diameter). The calculation of the exact overload duration depends highly on the motor current and the winding temperature at the beginning.

Max. permissible winding temperature
Due to the winding resistance, the motor current causes the winding to heat up. To prevent the motor from overheating, this heat needs to be dissipated to the environment via the stator. The maximum winding temperature (line 22 of the motor data) must not be exceeded even for a short time. For graphite brush motors and EC motors with their usually higher current load, it is 125 °C (in some cases up to 155 °C). Precious metal commutated motors only allow for low current loads, so that the rotor temperature must not exceed 85 °C. Precautions taken during installation, such as good air circulation or cooling plates, may significantly lower the temperature.

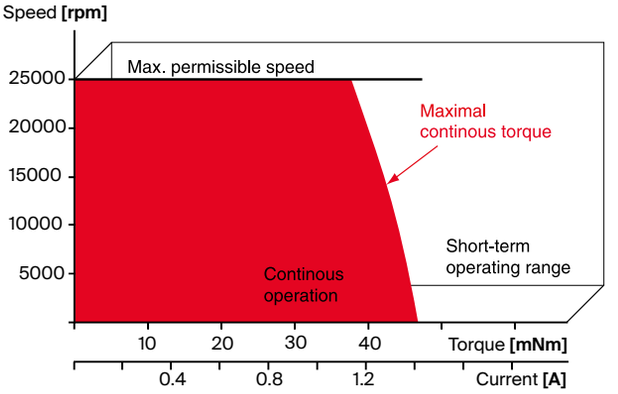
Permissible continuous current, permissible continuous torque
The electrical heat losses define the max. permissible continuous current at which the maximum winding temperature is reached under standard conditions (25°C ambient temperature, no heat dissipation via the flange, air circulating freely). Larger motor currents result in too high winding temperatures.

The nominal current is selected to correspond with this maximum permissible continuous current. It is highly dependent on the winding. Windings with thin wire have lower nominal currents than windings with thick wire. In the case of windings with very low resistance, the current capacity of the brush system can further restrict the permissible continuous current. The graphite brush motors significantly increase the friction losses at high speeds. In EC motors, the eddy current loss in the magnetic return increases when the speed increases and generates additional heat. The maximum permissible continuous current decreases at higher speeds.

The nominal current assigned to the rated torque is practically constant within the winding type of a motor type and is one of the characteristics of the motor type.

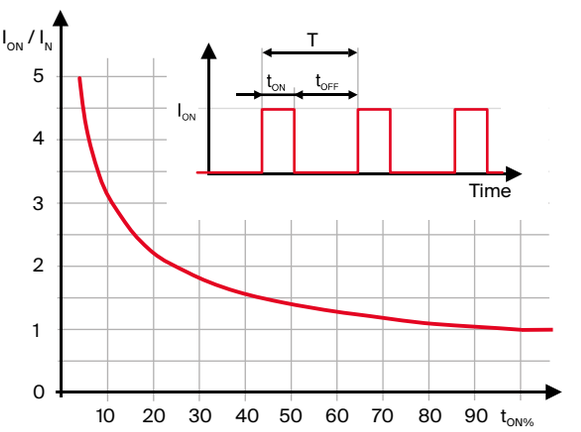
The maximum permissible speed
for DC motors is primarily limited by the commutation system. The commutator and brushes wear more rapidly at very high speeds. The reasons are:
– Increased mechanical wear because of the large traveled path of the commutator
– Increased electro-erosion because of brush vibration and spark formation.

A further reason for limiting the speed is the rotor’s residual mechanical imbalance which shortens the service life of the bearings. Higher speeds than the limit speed n_{max} (line 23) are possible, however, they are “paid for” by a reduced service life expectancy. The maximum permissible speed for the EC motor is calculated based on service life considerations of the ball bearings (at least 20000 hours) at the maximum residual imbalance and bearing load.



Operating range diagram

Intermittent operation
Switch-on duration and current



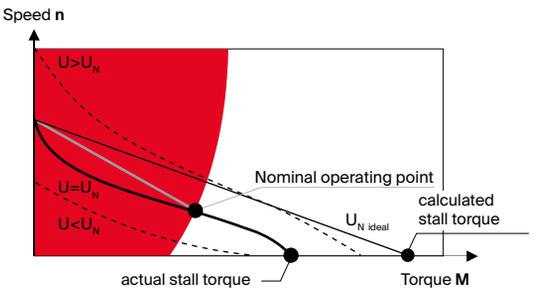
ON	Motor in operation
OFF	Motor stationary
I_{ON}	Max. peak current
I_N	Max. permissible continuous current (line 6)
t_{ON}	ON time *[s]*, should not exeed τ_w (line 19)
T	Cycle time $t_{ON} + t_{OFF}$ *[s]*
$t_{ON\%}$	Duty cycle as percentage of cycle time. The motor may be overloaded by the relationship I_{ON} / I_N at X % of the total cycle time.

$$I_{on} = I_N \sqrt{\frac{T}{t_{ON}}}$$

maxon EC flat and EC-i motors

Multi-pole maxon flat motors and EC-i motors require a greater number of commutation steps per revolution (6 x number of pole pairs). Due to their wound stator teeth, they have a higher terminal inductance than motors with an ironless winding. At high speeds, the current cannot fully develop due to the short commutation intervals. The torque is therefore less. In addition, some current is returned to the controller power stage. As a result, the behavior deviates from the ideal linear characteristic depending on voltage and speed: The apparent speed/torque gradient is steeper at higher speeds and flatter at very low speeds.
Mostly, flat motors are operated in the continuous operation range where the achievable speed-torque gradient at nominal voltage can be approximated by a straight line between no load speed and nominal operating point. The achievable speed-torque gradient is approximate.

$$\frac{\Delta n}{\Delta M} \approx \frac{n_0 - n_N}{M_N}$$

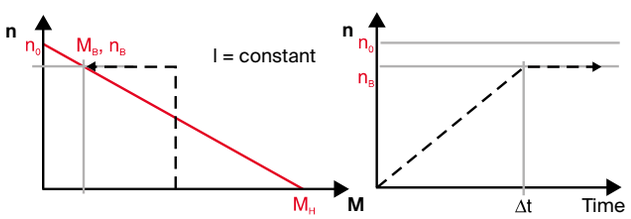


The stall torque specified on the product page is equal to the linearly calculated load torque (without magnetic saturation effect) which causes the shaft to stall at nominal voltage. With EC-flat and EC-i motors, this torque often cannot be achieved due to saturation effects.

Acceleration

In accordance with the electrical boundary conditions (power supply, control, battery), a distinction is primarily made between two different starting processes:
– Start at constant voltage (without current limitation)
– Start at constant current (with current limitation)

Start under constant current
A current limit always means that the motor can only deliver a limited torque. In the speed-torque diagram, the speed increases on a vertical line with a constant torque. Acceleration is also constant, thus simplifying the calculation. Start at constant current is usually found in applications with servo amplifiers, where acceleration torques are limited by the amplifier's peak current.



– Angular acceleration α (in rad/s²) at constant current I or constant torque M with an additional load of inertia J_L:

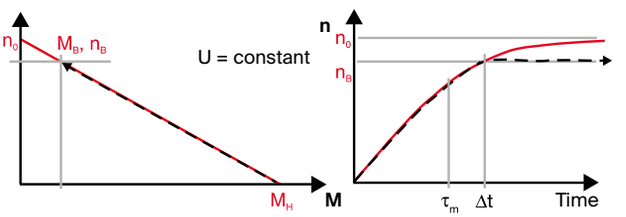
$$\alpha = 10^4 \cdot \frac{k_M \cdot I_{mot}}{J_R + J_L} = 10^4 \cdot \frac{M}{J_R + J_L}$$

– Run-up time Δt (in ms) at a speed change Δn with an additional load inertia J_L:

$$\Delta t = \frac{\pi}{300} \cdot \Delta n \cdot \frac{J_R + J_L}{k_M \cdot I_{mot}}$$

(all variables in units according to the catalog)

Start with constant terminal voltage
Here, the speed increases from the stall torque along the speed-torque line. The greatest torque and thus the greatest acceleration is effective at the start. The faster the motor turns, the lower the acceleration. The speed increases more slowly. This exponentially flattening increase is described by the mechanical time constant τ_m (line 15 of the motor data). After this time, the rotor at the free shaft end has attained 63% of the no load speed. After roughly three mechanical time constants, the rotor has almost reached the no load speed.



– Mechanical time constant τ_m (in ms) of the unloaded motor:

$$\tau_m = 100 \cdot \frac{J_R \cdot R}{k_M^2}$$

– Mechanical time constants τ_m' (in ms) with an additional load inertia J_L:

$$\tau_m' = 100 \cdot \frac{J_R \cdot R}{k_M^2} \left(1 + \frac{J_L}{J_R}\right)$$

– Maximum angular acceleration α_{max} (in rad/s²) of the unloaded motor:

$$\alpha_{max} = 10^4 \cdot \frac{M_H}{J_R}$$

– Maximum angular acceleration α_{max} (in rad/s²) with an additional load inertia J_L:

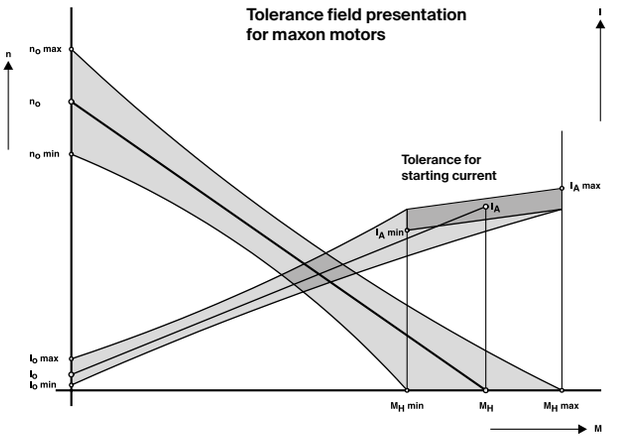
$$\alpha_{max} = 10^4 \cdot \frac{M_H}{J_R + J_L}$$

– Run-up time (in ms) at constant voltage up to the operating point (M_L, n_L):

$$\Delta t = \tau_m' \cdot ln \left(\frac{\left(1 - \frac{M_L + M_R}{M_H}\right) \cdot n_0}{\left(1 - \frac{M_L + M_R}{M_H}\right) \cdot n_0 - n_L} \right)$$

Tolerances

Tolerances must be considered in critical ranges. The possible deviations of the mechanical dimensions can be found in the overview drawings. The motor data are average values: the adjacent diagram shows the effect of tolerances on the curve characteristics. They are mainly caused by differences in the magnetic field strength and in wire resistance, and not so much by mechanical influences. The changes are heavily exaggerated in the diagram and are simplified to improve understanding. It is clear, however, that in the motor's actual operating range, the tolerance range is more limited than at start or at no load. Our computer sheets contain all detailed specifications.



Thermal behavior

The Joule power losses P_J in the winding determine heating of the motor. This heat energy must be dissipated via the surfaces of the winding and motor. The increase ΔT_W of the winding temperature T_W with regard to the ambient temperature arises from heat losses P_J and thermal resistances R_{th1} and R_{th2}.

$$T_W - T_U = \Delta T_W = (R_{th1} + R_{th2}) \cdot P_J$$

Here, thermal resistance R_{th1} relates to the heat transfer between the winding and the stator (magnetic return and magnet), whereas R_{th2} describes the heat transfer from the housing to the environment. Mounting the motor on a heat dissipating chassis noticeably lowers thermal resistance R_{th2}. The values specified in the data sheets for thermal resistances and the maximum continuous current were determined in a series of tests, in which the motor was end-mounted onto a vertical plastic plate. The modified thermal resistance R_{th2} that occurs in a particular application must be determined using original installation and ambient conditions. Thermal resistance R_{th2} on motors with metal flanges decreases by up to 80% if the motor is coupled to a good heat-conducting (e.g. metallic) retainer.

The heating runs at different rates for the winding and stator due to the different masses. After switching on the current, the winding heats up first (with time constants from several seconds to half a minute). The stator reacts much slower, with time constants ranging from 1 to 30 minutes depending on motor size. A thermal balance is gradually established. The temperature difference of the winding compared to the ambient temperature can be determined with the value of the current I (or in intermittent operation with the effective value of the current $I = I_{RMS}$).

$$\Delta T_W = \frac{(R_{th1} + R_{th2}) \cdot R \cdot I_{mot}^2}{1 - \alpha_{Cu} \cdot (R_{th1} + R_{th2}) \cdot R \cdot I_{mot}^2}$$

Here, electrical resistance R must be applied at the actual ambient temperature.

Influence of temperature
An increased motor temperature affects winding resistance and magnetic characteristic values.

Winding resistance increases linearly according to the thermal resistance coefficient for copper (α_{Cu} = 0.0039):

$$R_T = R_{25} \cdot (1 + \alpha_{Cu} (T - 25°C))$$

Example: a winding temperature of 75°C causes the winding resistance to increase by nearly 20%.

The magnet becomes weaker at higher temperatures. The reduction is 0.5 to 5% at 75°C depending on the magnet material.

The most important consequence of increased motor temperature is that the speed curve becomes steeper which reduces the stall torque. The changed stall torque can be calculated in first approximation from the voltage and increased winding resistance:

$$M_H = k_M \cdot I_A = k_M \cdot \frac{U_{mot}}{R_T}$$

Motor selection

The drive requirements must be defined before proceeding to motor selection.
– How fast and at which torques does the load move?
– How long do the individual load phases last?
– What accelerations take place?
– How great are the mass inertias?
Often the drive is indirect, this means that there is a mechanical transformation of the motor output power using belts, gears, screws and the like. The drive parameters, therefore, are to be calculated to the motor shaft. Additional steps for gear selection are listed below.

Furthermore, the power supply requirements need to be checked.
– Which maximum voltage is available at the motor terminals?
– Which limitations apply with regard to current?
The current and voltage of motors supplied with batteries or solar cells are very limited. In the case of control of the unit via a servo amplifier, the amplifier's maximum current is often an important limit.

Selection of motor types
The possible motor types are selected using the required torque. On the one hand, the peak torque, M_{max}, is to be taken into consideration and on the other, the effective torque M_{RMS}. Continuous operation is characterized by a single operating or load point (M_L, n_L). The motor types in question must have a nominal torque (= max. continuous torque) M_N that is greater than load torque M_L.

$M_N > M_L$

In operating cycles, such as start/stop operation, the motor's nominal torque must be greater than the effective load torque (RMS). This prevents the motor from overheating.

$M_N > M_{RMS}$

The stall torque of the selected motor should usually exceed the emerging load peak torque.

$M_H > M_{max}$

Selection of the winding: electric requirement
In selecting the winding, it must be ensured that the voltage applied directly to the motor is sufficient for attaining the required speed in all operating points.

Uncontrolled operation
In applications with only one operating point, this is often achieved with a fixed voltage U. A winding is sought with a speed-torque line that passes through the operating point at the specified voltage. The calculation uses the fact that all motors of a type feature practically the same speed-torque gradient. A target no load speed $n_{0,theor}$ is calculated from operating point (n_L, M_L).

$$n_{0,\,theor} = n_L + \frac{\Delta n}{\Delta M} M_L$$

This target no load speed must be achieved with the existing voltage U, which defines the target speed constant.

$$k_{n,\,theor} = \frac{n_{0,\,theor}}{U_{mot}}$$

Those windings whose k_n is as close to $k_{n,\,theor}$ as possible, will approximate the operating point the best at the specified voltage. A somewhat larger speed constant results in a somewhat higher speed, a smaller speed constant results in a lower one. The variation of the voltage adjusts the speed to the required value, a principle that servo amplifiers also use.

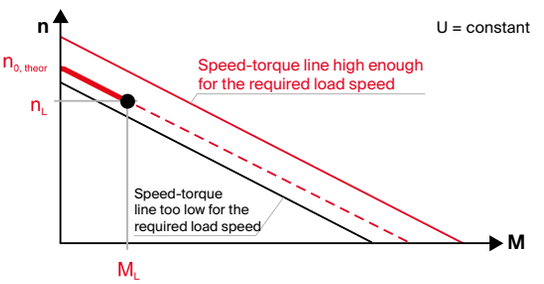
The motor current I_{mot} is calculated using the torque constant k_M of the selected winding and the load torque M_L.

$$I_{mot} = \frac{M_L}{k_M}$$

Advices for evaluating the requirements:
Often the load points (especially the torque) are not known or are difficult to determine. In such cases you can operate your device with a measuring motor roughly estimated according to size and power. Vary the voltage until the desired operating points and motion sequences have been achieved. Measure the voltage and current flow. Using these specifications and the part number of the measuring motor, our engineers can often specify the suitable motor for your application.

Additional optimization criteria are, for example:
– Mass to be accelerated (type, mass inertia)
– Type of operation (continuous, intermittent, reversing)
– Ambient conditions (temperature, humidity, medium)
– Power supply, battery

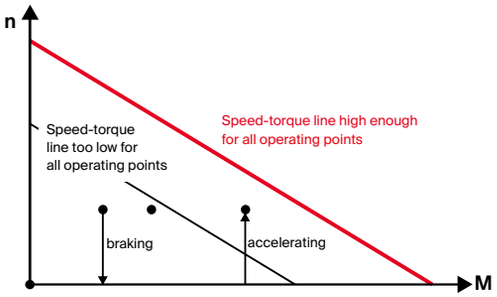
When selecting the motor type, other constraints also play a major role:
– What maximum length should the drive unit have, including gear and encoder diameter?
– What service life is expected from the motor and which commutation system should be used?
– Precious metal commutation for continuous operation at low currents (rule of thumb for longest service life: up to approx. 50% of I_N).
– Graphite commutation for high continuous currents (rule of thumb: 50% to approx. 75% of I_N) and frequent current peaks (start/stop operation, reversing operation).
– Electronic commutation for highest speeds and longest service life.
– How great are the forces on the shaft, do ball bearings have to be used or are less expensive sintered bearings sufficient?



Regulated servo drives
In operating cycles, all operating points must lie beneath the curve at a maximum voltage U_{max}. Mathematically, this means that the following must apply for all operating points (n_L, M_L):

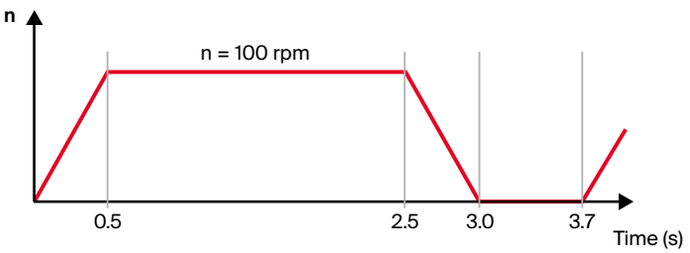
$$k_n \cdot U_{max} = n_0 > n_L + \frac{\Delta n}{\Delta M} M_L$$

When using servo amplifiers, a voltage drop occurs at the power stage, so that the effective voltage applied to the motor is lower. This must be taken into consideration when determining the maximum supply voltage U_{max}. It is recommended that a regulating reserve of some 20% be included, so that regulation is even ensured with an unfavorable tolerance situation of motor, load, amplifier and supply voltage. Finally, the average current load and peak current are calculated ensuring that the servo amplifier used can deliver these currents. In some cases, a higher resistance winding must be selected, so that the currents are lower. However, the required voltage is then increased.



Example for motor/gear selection

The following speed curve is to be repeated cyclically.



The accelerated load inertia J_L is 300 000 gcm² = 0.03 kgm². The friction torque is 400 mNm. The motor is driven with the 4-Q servo amplifier ESCON 36/2 DC for DC motors. The power supply has a maximum output of 3 A and 24 V.

Calculation of load data
The torque required for acceleration and braking are calculated as follows (motor and gearhead inertia omitted):

$$M_\alpha = J_L \cdot \frac{\pi}{30} \frac{\Delta n}{\Delta t} = 0.03 \cdot \frac{\pi}{30} \cdot \frac{100}{0.5} = 0.628 \text{ Nm} = 628 \text{ mNm}$$

Together with the friction torque, the following torques result for the different phases of motion.

– Acceleration phase	(duration 0.5 s)	1028 mNm
– Constant speed	(duration 2 s)	400 mNm
– Braking (friction brakes with 400 mNm)	(duration 0.5 s)	-228 mNm
– Standstill	(duration 0.7 s)	0 mNm

Peak torque occurs during acceleration.
The RMS determined torque of the entire operating cycle is

$$M_{RMS} = \sqrt{\frac{t_1 \cdot M^2_1 + t_2 \cdot M^2_2 + t_3 \cdot M^2_3 + t_4 \cdot M^2_4}{t_{tot}}}$$

$$= \sqrt{\frac{0.5 \cdot 1028^2 + 2 \cdot 400^2 + 0.5 \cdot (-228)^2 + 0.7 \cdot 0}{3.7}} \approx 486 \text{ mNm}$$

The maximum speed (100 rpm) occurs at the end of the acceleration phase at maximum torque (1028 mNm). Thus, the peak mechanical power is:

$$P_{max} = M_{max} \cdot \frac{\pi}{30} n_{max} = 1.028 \cdot \frac{\pi}{30} \cdot 100 \approx 11 \text{ W}$$

Physical variables		and their units SI	Catalog
i	Gear reduction*		
I_{mot}	Motor current	A	A, mA
I_A	Stall current*	A	A, mA
I_0	No load current*	A	mA
I_{RMS}	RMS determined current	A	A, mA
I_N	Nominal current*	A	A, mA
J_R	Moment of inertia of the rotor*	kgm²	gcm²
J_L	Moment of inertia of the load	kgm²	gcm²
k_M	Torque constant*	Nm/A	mNm/A
k_n	Speed constant*		rpm/V
M	(Motor) torque	Nm	mNm
M_L	Load torque	Nm	mNm
M_H	Stall torque*	Nm	mNm
M_{mot}	Motor torque	Nm	mNm
M_R	Moment of friction	Nm	mNm
M_{RMS}	RMS determined torque	Nm	mNm
M_N	Nominal torque	Nm	mNm
$M_{N,G}$	Max. torque of gear*	Nm	Nm
n	Speed		rpm
n_L	Operating speed of the load		rpm
n_{max}	Limit speed of motor*		rpm
$n_{max,G}$	Limit speed of gear*		rpm
n_{mot}	Motor speed		rpm
n_0	No load speed*		rpm
P_{el}	Electrical power	W	W
P_J	Joule power loss	W	W
P_{mech}	Mechanical power	W	W
R	Terminal resistance	Ω	Ω
R_{25}	Resistance at 25°C*	Ω	Ω
R_T	Resistance at temperature T	Ω	Ω
R_{th1}	Heat resistance winding housing*		K/W
R_{th2}	Heat resistance housing/air*		K/W
t	Time	s	s
T	Temperature	K	°C
T_{max}	Max. winding temperature*	K	°C
T_U	Ambient temperature	K	°C
T_W	Winding temperature	K	°C
U_{mot}	Motor voltage	V	V
U_{ind}	Induced voltage (EMF)	V	V
U_{max}	Max. supplied voltage	V	V
U_N	Nominal voltage*	V	V
α_{Cu}	Resistance coefficient of Cu	= 0.0039	
α_{max}	Max. angle acceleration	rad/s²	
$\Delta n/\Delta M$	Curve gradient*	rpm/mNm	
ΔT_W	Temperature difference winding/ambient	K	K
Δt	Run up time	s	ms
η	(Motor) efficiency		%
η_G	(Gear) efficiency*		%
η_{max}	Max. efficiency*		%
τ_m	Mechanical time constant*	s	ms
τ_S	Therm. time constant of the motor*	s	s
τ_W	Therm. time constant of the winding*	s	s

(*Specified in the motor or gear data)

Gear selection
We are looking for a gearhead with a maximum continuous torque of at least 0.486 Nm and a short-term torque of at least 1.028 Nm. This requirement can be fulfilled by the ceramic version of the configurable GPX 22 gearhead with 2 or 3 stages. With 2 stages, the maximum gearhead input speed of 10 000 rpm permits a maximum ratio of

$$i_{max} = \frac{n_{max,\,G}}{n_L} = \frac{10000}{100} = 100{:}1$$

Three-stage gearheads permit higher input speeds, and the maximum ratio is 120:1. Because of the shorter design, we decide to use the 2-stage gearhead. To keep the motor torque as small as possible, we select the highest possible ratio of 44:1. The 2-stage gearhead has an efficiency of 81%.

Motor type selection
Speed and torque are calculated to the motor shaft

$$n_{mot} = i \cdot n_L = 44 \cdot 100 = 4400\ rpm$$

$$M_{mot,\,RMS} = \frac{M_{RMS}}{i \cdot \eta} = \frac{486}{44 \cdot 0.81} \approx 13.6\ mNm$$

$$M_{mot,\,max} = \frac{M_{max}}{i \cdot \eta} = \frac{1028}{44 \cdot 0.81} \approx 28.8\ mNm$$

The possible motors, which match the selected gears in accordance with the maxon modular system, are summarized in the table opposite. The table shows only motors with graphite commutation because they are better suited for stop-and-go operation.

We select the DCX 22 S, which has sufficient continuous torque. The motor should have a torque reserve so that it will be able to function in slightly less favorable conditions.
The additional torque requirement during acceleration is no problem for the motor. The short-term peak torque is only slightly less than twice as high as the permissible continuous torque of the motor.

Selection of the winding
The DCX 22 S motor has a mean characteristic gradient of about 110 rpm/mNm. The desired idle speed is calculated as follows:

$$n_{0,\,theor} = n_{mot} + \frac{\Delta n}{\Delta M} \cdot M_{max} = 4400 + 110 \cdot 28.8 = 7570\ rpm$$

The extreme operating point should of course be used in the calculation (max. speed and max. torque), since the speed-torque line of the winding must run above all operating points in the speed / torque diagram.
This target no load speed must be achieved with the maximum voltage U = 24 V supplied by the control (ESCON 36/2), which defines the minimum target speed constant $k_{n,\,theor}$ of the motor.

$$k_{n,\,theor} = \frac{n_{0,\,theor}}{U_{mot}} = \frac{7570}{24} = 315\ \frac{rpm}{V}$$

If one considers the speed constant of the windings, then the first choice would be the motor with a nominal speed of 36 V. At a speed constant of 342 rpm V^{-1} however, it has only a small speed control reserve. If the tolerances are insufficient, then the winding with the next higher speed constant (24 V nominal voltage) offers better safety.
The higher speed constant of the winding compared to the calculated value means that the motor runs faster at 24 V than required, which can be compensated with the speed controller. The motor can be equipped with an encoder to record the speed. The speed constant of the selected 24 V winding is 18.4 mNm/A. The maximum torque therefore corresponds to a peak current of

$$I_{max} = \frac{M_{max}}{k_M} + I_0 = \frac{28.8}{18.4} + 0.036 = 1.6\ A$$

This current is smaller than the maximum current (4 A) of the controller and the power supply unit (3 A).

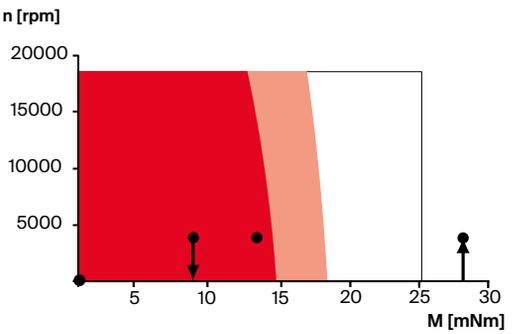
Thus, a gear motor has been found that fulfils the requirements (torque and speed) and can be operated by the controller provided.

Alternative solutions

GPX 19 ceramic gearhead
3 stages (138:1 reduction)
with motor type DCX 16 S (graphite brushes)

GPX 22 gearhead, standard configuration
3 stages (111:1 reduction)
with motor type DCX 19 S (graphite brushes)

Motor	M_N	Suitability
DCX 22 S	≈ 15 mNm	good
DCX 22 L	≈ 30 mNm	too strong, builds long
DC-max 22 S	≈ 11 mNm	too weak



maxon Conversion Tables

maxon

General Information

Quantities and their basic units in the International System of Measurements (SI)

Quantity	Basic-unit	Sign
Length	Meter	m
Mass	Kilogram	kg
Time	Second	s
Electrical current	Ampere	A
Thermodynamic Temperature	Kelvin	K

Conversion Example
A known unit
B unit sought

known:	multiply by sought:	
oz-in	7.06	mNm

Factors used for ...

... conversions:
1 oz = $2.834952313 \cdot 10^{-2}$ kg
1 in = $2.54 \cdot 10^{-2}$ m

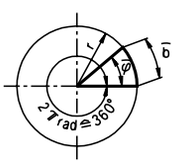
... gravitational acceleration:
g = 9.80665 m s^{-2}
= 386.08858 in s^{-2}

... derived units:
1 yd = 3 ft = 36 in
1 lb = 16 oz = 7000 gr (grains)
1 kp = 1 kg · 9.80665 ms^{-2}
1 N = 1 $kgms^{-2}$
1 W = 1 Nms^{-1} = 1 $kgm^2 s^{-3}$
1 J = 1 Nm = 1 Ws

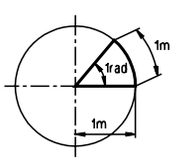
Decimal multiples and fractions of units

Prefix	Abbre-viation	Multiply	Prefix	Abbre-viation	Multiply
Deka . .	da	10^1	Dezi . .	d	10^{-1}
Hekto . .	h	10^2	Zenti . .	c	10^{-2}
Kilo . .	k	10^3	Milli . .	m	10^{-3}
Mega . .	M	10^6	Mikro . .	µ	10^{-6}
Giga . .	G	10^9	Nano . .	n	10^{-9}
Tera . .	T	10^{12}	Piko . .	p	10^{-12}

Arc definition



$\varphi = \frac{b}{r}$



$1\,rad = \frac{1m}{1m} \triangleq 57.2958°$

Units used in this brochure

Power — P [W]

B \ A	oz-in-s^{-1}	oz-in-min^{-1}	in-lbf-s^{-1}	ft-lbf-s^{-1}	W = N · ms^{-1}	mW	kpm s^{-1}	mNm min^{-1}
W = N · ms^{-1}	$7.06 \cdot 10^{-3}$	$1.17 \cdot 10^{-4}$	0.113	1.356	1	$1 \cdot 10^{-3}$	9.807	$2\pi/60000$
mW	7.06	0.117	112.9	$1.356 \cdot 10^3$	$1 \cdot 10^3$	1	$9.807 \cdot 10^3$	$2\pi/60$
oz-in-s^{-1}	1	1/60	16	192	141.6	0.142	$1.39 \cdot 10^3$	$2.36 \cdot 10^{-3}$
ft-lbf-s^{-1}	1/192	1/11520	1/12	1	0.737	$0.737 \cdot 10^{-3}$	7.233	$1.23 \cdot 10^{-5}$
kpm s^{-1}	$7.20 \cdot 10^{-4}$	$1.2 \cdot 10^{-5}$	$1.15 \cdot 10^{-2}$	0.138	0.102	$0.102 \cdot 10^{-3}$	1	$1.70 \cdot 10^{-6}$

Torque — M [Nm]

B \ A	oz-in	ft-lbf	Nm = Ws	Ncm	mNm	kpm	pcm	
Nm	$7.06 \cdot 10^{-3}$	1.356	1	$1 \cdot 10^{-2}$	$1 \cdot 10^{-3}$	9.807	$9.807 \cdot 10^{-5}$	
mNm	7.06	$1.356 \cdot 10^3$	$1 \cdot 10^3$	10	1	$9.807 \cdot 10^3$	$9.807 \cdot 10^{-2}$	
kpm	$7.20 \cdot 10^{-4}$	0.138	0.102	$0.102 \cdot 10^{-2}$	$0.102 \cdot 10^{-3}$	1	$1 \cdot 10^{-5}$	
oz-in	1	192	141.6	1.416	0.142	$1.39 \cdot 10^3$	$1.39 \cdot 10^{-2}$	
ft-lbf	1/192	1	0.737	$0.737 \cdot 10^{-2}$	$0.737 \cdot 10^{-3}$	7.233	$7.233 \cdot 10^{-5}$	

Moment of Inertia — J [kg m^2]

B \ A	oz-in^2	oz-in-s^2	lb-in^2	lb-in-s^2	Nms^2=kgm^2	mNm s^2	gcm^2	kpm s^2
g cm^2	182.9	$7.06 \cdot 10^4$	$2.93 \cdot 10^3$	$1.13 \cdot 10^6$	$1 \cdot 10^7$	$1 \cdot 10^4$	1	$9.807 \cdot 10^7$
kgm^2=Nms^2	$1.83 \cdot 10^{-5}$	$7.06 \cdot 10^{-3}$	$2.93 \cdot 10^{-4}$	0.113	1	$1 \cdot 10^{-3}$	$1 \cdot 10^{-7}$	9.807
oz-in^2	1	386.08	16	$6.18 \cdot 10^3$	$5.46 \cdot 10^4$	54.6	$5.46 \cdot 10^{-3}$	$5.35 \cdot 10^5$
lb-in^2	1/16	24.130	1	386.08	$3.41 \cdot 10^3$	3.41	$3.41 \cdot 10^{-4}$	$3.35 \cdot 10^4$

Mass — m [kg]

B \ A	oz	lb	gr (grain)	kg	g
kg	$28.35 \cdot 10^{-3}$	0.454	$64.79 \cdot 10^{-6}$	1	$1 \cdot 10^{-3}$
g	28.35	$0.454 \cdot 10^3$	$64.79 \cdot 10^{-3}$	$1 \cdot 10^3$	1
oz	1	16	$2.28 \cdot 10^{-3}$	35.27	$35.27 \cdot 10^3$
lb	1/16	1	1/7000	2.205	$2.205 \cdot 10^3$
gr (grain)	437.5	7000	1	$15.43 \cdot 10^3$	$15.43 \cdot 10^6$

Force — F [N]

B \ A	oz	lbf	N	kp	p
N	0.278	4.448	1	9.807	$9.807 \cdot 10^{-3}$
kp	0.028	0.454	0.102	1	$1 \cdot 10^{-3}$
oz	1	16	3.600	35.27	$35.27 \cdot 10^{-3}$
lbf	1/16	1	0.225	2.205	$2.205 \cdot 10^{-3}$
pdl	2.011	32.17	7.233	70.93	$70.93 \cdot 10^{-3}$

Length — l [m]

B \ A	in	ft	yd	Mil	m	cm	mm	µ
m	$25.4 \cdot 10^{-3}$	0.305	0.914	$25.4 \cdot 10^{-6}$	1	0.01	$1 \cdot 10^{-3}$	$1 \cdot 10^{-6}$
cm	2.54	30.5	91.4	$25.4 \cdot 10^{-4}$	$1 \cdot 10^2$	1	0.1	$1 \cdot 10^{-4}$
mm	25.4	305	914	$25.4 \cdot 10^{-3}$	$1 \cdot 10^3$	10	1	$1 \cdot 10^{-3}$
in	1	12	36	$1 \cdot 10^{-3}$	39.37	0.394	$3.94 \cdot 10^{-2}$	$3.94 \cdot 10^{-5}$
ft	1/12	1	3	$1/12 \cdot 10^{-3}$	3.281	$3.281 \cdot 10^{-2}$	$3.281 \cdot 10^{-3}$	$3.281 \cdot 10^{-6}$

Angular Velocity — ω [s^{-1}]

B \ A	s^{-1} = Hz	rpm	rad s^{-1}
rad s^{-1}	2π	π/30	1
rpm	1/60	1	30/π

Angular Acceleration — α [s^{-2}]

B \ A	min^{-2}	s^{-2}	rad s^{-2}	min^{-1} s^{-1}
s^{-2}	1/3600	1	1/2π	1/60
rad s^{-2}	π/1800	2π	1	π/30

Linear Velocity — v [m s^{-1}]

B \ A	in-s^{-1}	in-min^{-1}	ft-s^{-1}	ft-min^{-1}	m s^{-1}	cm s^{-1}	mm s^{-1}	m min^{-1}
m s^{-1}	$2.54 \cdot 10^{-2}$	$4.23 \cdot 10^{-4}$	0.305	$5.08 \cdot 10^{-3}$	1	$1 \cdot 10^{-2}$	$1 \cdot 10^{-3}$	1/60
in-s^{-1}	1	60	12	720	39.37	$39.37 \cdot 10^{-2}$	$39.37 \cdot 10^{-3}$	0.656
ft-s^{-1}	1/12	5	1	60	3.281	$3.281 \cdot 10^{-2}$	$3.281 \cdot 10^{-3}$	$5.46 \cdot 10^{-2}$

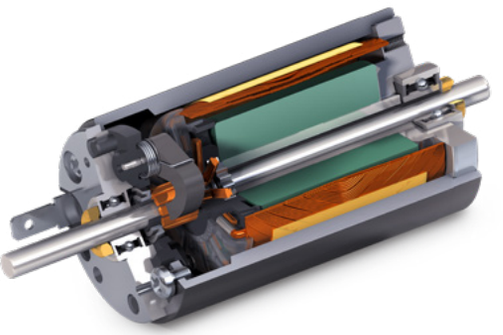
Temperature — T [K]

B \ A	° Fahrenheit	° Celsius = Centigrade	Kelvin
Kelvin	(°F -305.15) / 1.8	+ 273.15	1
° Celsius	(°F -32) / 1.8	1	-273.15
° Fahrenheit	1	1.8°C + 32	1.8 K + 305.15

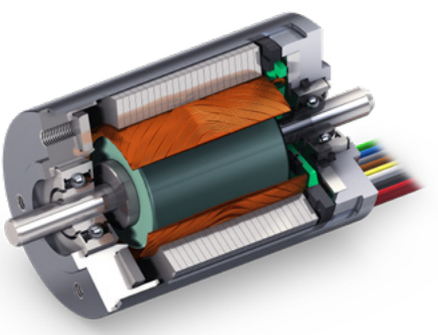
maxon standard specification

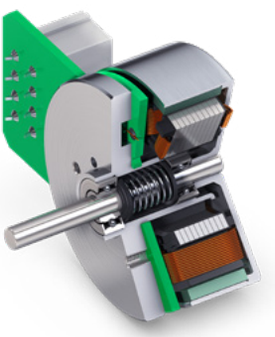
Our standard specifications gives you the means to assess the key aspects of maxon products. In our experience, the standard specifications cover normal cases. It is part of our Terms and Conditions of Delivery.

Standard specification no. 100
maxon DC motor



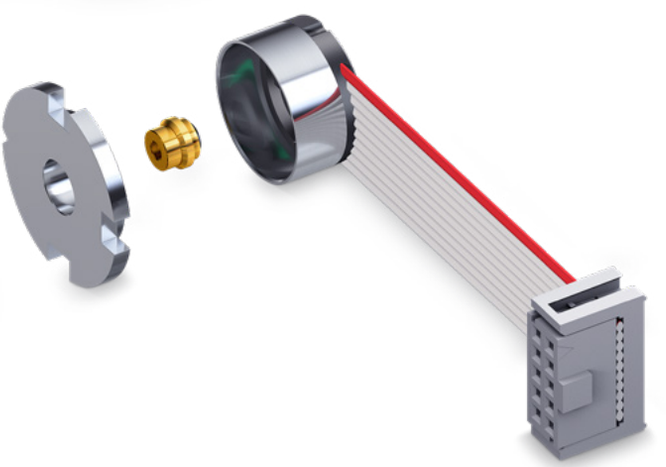
Standard specification no. 101
maxon EC motor





Standard specification no. 102
maxon gear
maxon screw drive

Standard specification no. 103
maxon sensor



Standard specification no. 100
maxon DC motor

1 **Basics**
The standard specification describes tests and inspections that are performed on the finished motor and during the manufacturing process. To safeguard our high quality standard, we inspect materials, individual parts, assemblies, and the finished motor for conformity with specified dimensions and properties. The results are recorded statistically and can be viewed by the customer on request. Sampling plans in acc. with ISO 2859 and DIN/ISO 3951 are used (attribute inspection, follow-up inspection and variable inspection), as well as self-monitoring procedures of the manufacturing departments. This standard specification applies in all cases where no other specification has been agreed upon between the customer and maxon.

2. **Data**

2.1 **Electrical data** apply at temperatures between 22 and 25 °C. Data check within one minute of runtime.

Measuring voltage	±0.5% for voltages ≥ 3 V and ±0.015 V for voltages ≤ 3 V
No-load speed	±10 %
No-load current	≤ maximum
Direction of rotation	cw = clockwise
Motor orientation	horizontal or vertical

Additional information: The measuring voltage may deviate from the nominal voltage listed in the catalog. The no-load current specified in the catalog is a typical value, not the maximum. If the red wire or the terminal marked + is connected to the positive terminal, then the shaft (seen from the face) turns clockwise. For counterclockwise (ccw) operation, the specified tolerances may be exceeded slightly.
Terminal resistance: Winding resistance is checked in samples during production. The terminal resistance is determined during the product qualification. Observe that the terminal resistance depends on the rotor posi-tion. Because contact resistance of graphite brushes varies with the current density, resistance measurement with an ohmmeter does not deliver meaningful results for small currents. In the case of precious metal brushes, the resistance measurements show a value that's too low when the brush bridges two commutator plates, shorting part of a coil.
The **inductance** is determined during the product qualification. The measuring frequency is 1 kHz. The terminal inductance of the motor is frequency-dependent.
Commutation: The check for neutral setting and electrical errors, e.g. win-ding discontinuities or winding shorts, is performed using an oscilloscope. The commutation graphs of precious metal and graphite brushes are not directly comparable. Precious metal brushes have a clearer commutation graph that remains interference-free up to the limit speed, approximately. For graphite brushes, this can only be expected at speeds up to 1/3 of the limit speed. For graphite brush motors, the brush contact resistance changes over time. The same applies to the torque constant due to the overlap between commutator plates. As a result, the no-load current and the speed change slightly. A similar effect can be observed when the motor has been run without load over a long time.

2.2 **Mechanical data** as shown in the dimensional drawing: Assembly-dependent dimensions are sampled in acc. with the sampling schedule. This does not apply to form and position tolerances. The process uses standard measurement tools (electrical length measurement, micrometers, dial gauges, calipers, plug and thread gauges, etc.). The calibration of the measuring instruments follows the standards listed below:

– EN ISO 10012:2003 Measurement management systems – Requirements for measurement processes and measuring equipment
– EN ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
– VDI/VDE/DGQ 2618 Test equipment monitoring

2.3 **Imbalance:** Rotors are balanced according to our standard during the manufacturing process.

2.4 **Noise:** A subjective test is made for outliers within a batch. The motion inside a motor causes noise and vibration depending on speed. The noise and vibrations may vary in their frequency and intensity. The noise level of an individual sample does not permit any conclusions about the noise or vibration level of a future delivery.

2.5 **Service life:** Service life tests are conducted according to unified, internal criteria as part of the product qualification. The service life of a motor primarily depends on the operating modes and ambient conditions. The great diversity of applications does not permit us to make a general statement of service life.

2.6 **Environmental testing**
Corrosion protection: Our products are tested based on DIN EN 60068-2-30 during product qualification.
Coating of the components: The finishing and coating processes are selected for best corrosion protection. Such layers are checked during product qualification, in accordance with the applicable standard.

3. Parameters that deviate from or supplement the data sheet can be determined and then become part of the systematically performed inspection, as customer specification. Inspection certificates are supplied, if agreed upon in advance.

Standard specification no. 101
maxon EC motor

1. **Basics**
The standard specification describes tests and inspections that are performed on the finished motor and during the manufacturing process. To safeguard our high quality standard, we inspect materials, individual parts, assemblies, and the finished motor for conformity with specified dimensions and properties. The results are recorded statistically and can be viewed by the customer on request. Sampling plans in acc. with ISO 2859 and DIN/ISO 3951 are used (attribute inspection, follow-up inspection and variable inspection), as well as self-monitoring procedures of the manufacturing departments. This standard specification applies in all cases where no other specification has been agreed upon between the customer and maxon.

2. **Data**

2.1 **Electrical data** apply at temperatures from 22 to 25 °C, using a 1-quadrant controller with block commutation. Data check within one minute of runtime.

Measuring voltage	±0.5% for voltages > 3 V and ±0.015 V for voltages ≤ 3 V
No-load speed	±10 %
No-load current	≤ maximum
Direction of rotation	cw = clockwise
Motor orientation	horizontal or vertical

Additional information: The measuring voltage may deviate from the nominal voltage listed in the catalog. The no-load current specified in the catalog is a typical value, not the maximum. When connected as per the catalog (or marking), the shaft rotates clockwise (seen from the face side).
The **terminal resistance** is checked by sampling.
The **inductance** is determined during product qualification. The measuring frequency is 1 kHz. The terminal inductance is frequency-dependent. These measurements are sufficient to ensure compliance with electro-mechanical specifications.

2.2 **Mechanical data** as shown in the dimensional drawing: Assembly-dependent dimensions are sampled in acc. with the sampling schedule. This does not apply to form and position tolerances. The process uses standard measurement tools (electrical length measurement, micrometers, dial gauges, calipers, plug and thread gauges, etc.). The calibration of the measuring instruments follows the standards listed below:

– EN ISO 10012:2003 Measurement management systems – Requirements for measurement processes and measuring equipment
– EN ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
– VDI/VDE/DGQ 2618 Test equipment monitoring

2.3 **Imbalance:** Rotors for EC motors with air-gap windings are balanced in accordance with our standard during the manufacturing process. For EC motors with wound stator teeth, the rotors are mounted in gauges but, as a standard, are not balanced. For the finished motor, only a subjective assessment is possible, which is done by sampling.

2.4 **Following** DIN EN 60204-1 and EN 60034-1, the dielectric strength is always determined using a high-voltage tester. It is connected between motor connection (electrical) and motor housing or shaft. Parts with integrated electronics are excepted.

Test conditions for EC motors ≤ ∅13 mm
– Test voltage 250 VDC for 2 s (motor at standstill)
– Ramp time (up and down): 1 s
– Good / bad output
– Leakage current < 0.25 mA

Test conditions for EC motors > ∅13 mm
– Test voltage 500 VDC for 2 s (motor at standstill)
– Ramp time (up and down): 1 s
– Good / bad output
– Leakage current: < 0.5 mA

2.5 **Noise:** A subjective test is made for outliers within a batch. The motion inside a motor causes noise and vibration depending on speed. The noise and vibrations may vary in their frequency and intensity. The noise level of an individual sample does not permit any conclusions about the noise or vibration level of a future delivery.

2.6 **Service life:** Service life tests are conducted according to unified, internal criteria as part of the product qualification. The service life of an EC motor mainly depends on the bearing life. This is determined by the opera-ting mode, the bearing load, and ambient conditions. The great diversity of applications does not permit us to make a general statement of service life.

2.7 **Environmental testing**
Corrosion protection: Our products are tested based on DIN EN 60068-2-30 during product qualification.
Coating of the components: The finishing and coating processes are selected for best corrosion protection. Such layers are checked during product qualification, in accordance with the applicable standard.

3. Parameters that deviate from or supplement the data sheet can be determined and then become part of the systematically performed inspection, as customer specification. Inspection certificates are supplied, if agreed upon in advance.

Standard specification no. 102

maxon gear / maxon screw drive

1. **Basics**
The standard specification describes tests and inspections that are performed on the finished gearhead and during the manufacturing process. To safeguard our high quality standard, we inspect materials, individual parts, assemblies, and the finished gearhead for conformity with specified dimen-sions and properties. The results are recorded statistically and can be viewed by the customer on request. Sampling plans in acc. with ISO 2859 and DIN/ISO 3951 are used (attribute inspection, follow-up inspection and variable inspection), as well as self-monitoring procedures of the manufacturing departments. This specification applies in all cases where no other specification has been agreed upon between the customer and maxon.

2. **Data**

2.1 **Mechanical data** as shown in the dimensional drawing: Assembly-dependent dimensions are sampled in acc. with the sampling schedule. This does not apply to form and position tolerances. The process uses standard measurement tools (electrical length measurement, micrometers, dial gauges, calipers, plug and thread gauges, etc.). The calibration of the measuring instruments follows the standards listed below:

- EN ISO 10012:2003 Measurement management systems – Requirements for measurement processes and measuring equipment
- EN ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
- VDI/VDE/DGQ 2618 Test equipment monitoring

2.2 **Noise**
A subjective test is made for outliers within a batch. The motion inside a gearhead causes noise and vibration depending on speed. The noise and vibrations may vary in their frequency and intensity. The noise levels of an individual sample do not permit any conclusions about the noise or vibration level of a future delivery.

2.3 **Service life**
Service life tests are conducted according to unified, internal criteria as part of the product qualification. The service life of a gearhead primarily depends on the operating modes and ambient conditions. The great diversity of applications does not permit us to make a general statement of service life. The minimum expected service life for the relevant maxon gearheads is in reference to standard conditions.

- 25°C
- Normal room conditions
- Horizontal orientation of unit
- No axial or radial load on the output shaft

2.4 **Environmental testing**
Corrosion protection: Our products are tested based on DIN EN 60068-2-30 during product qualification.
Coating of the components: The finishing and coating processes are selected for best corrosion protection. Such layers are checked during product qualification, in accordance with the applicable standard.

3. Parameters that deviate from or supplement the data sheet can be determined and then become part of the systematically performed inspection, as customer specification. Inspection certificates are supplied, if agreed upon in advance.

Standard specification no. 103

maxon sensor

1. **Basics**
The standard specification describes tests and inspections that are performed on the finished combination of sensor and motor (in some cases also with gearhead), as well as during the manufacturing process. To safeguard our high quality standard, we inspect materials, individual parts, assemblies and the finished combination for conformity with the specified dimensions and properties. For sensor testing, it is necessary to keep in mind that the measuring signal inevitably contains the speed fluctuations of the motor and in some cases those of the gearhead.
The results are recorded statistically. Sampling plans in acc. with ISO 2859 and DIN / ISO 3951 are used (attribute inspection, follow-up inspection and variable inspection), as well as self-monitoring procedures of the manufacturing departments. This standard specification applies in all cases where no other specification has been agreed upon between the customer and maxon.

2. **Data**

2.1 **Electrical data** apply at temperatures between 22 and 25 °C. Data check within one minute of runtime or a minimum of three measuring revolutions.

The conditions during the sensor measurement are:

Operating voltage	Set value ±50 mV
Direction of rotation	cw = clockwise
Motor orientation	Horizontal
Operation	No load
Measuring speed	Set value ±40%

Every **incremental** encoder is tested while installed:

Current draw	Minimum/maximum value
Signal level	For encoders without a line driver (“single-ended output”): “Low” level: maximum value; “High” level: minimum value For encoders with a line driver (“differential output”): Controlling an RS422-compatible line receiver.
Signal integrity	Signals present Counts per turn (3-channel encoder) Single unique index pulse (if applicable)
Angle information	For the angle information, one or several of the following characteristics are tested, depending on the technology: Phasing A to B, duty cycles of the incremental signals, cycle length, INL, DNL, minimum/maximum state length, jitter

Additional information: maxon testing devices have built-in glitch filters. Glitches on individual encoder signals are not recognized and are permissible.

Every absolute encoder is tested while installed:

Current draw	Minimum/maximum value
Signal integrity	CLK signals, data present Protocol in acc. with the specification (SSI, BiSS, coding) Counting direction of angle values: as listed in catalog

2.2 **Mechanical data** as shown in the dimensional drawing: Assembly-dependent dimensions are sampled in acc. with the sampling schedule. This does not apply to form and position tolerances. The process uses standard measurement tools (electrical length measurement, micrometers, dial gauges, calipers, plug and thread gauges, etc.). The calibration of the measuring instruments follows the standards listed below:

- EN ISO 10012:2003 Measurement management systems – Requirements for measurement processes and measuring equipment
- EN ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
- VDI/VDE/DGQ 2618 Test equipment monitoring

2.3 **Imbalance**
The solid measure of the sensor (target, pole wheel) is mounted on the shaft and can cause additional imbalance.

2.4 **Service life**
The service life of sensors is usually not limited by wear but by the ambient conditions. These are highly diverse, so that no general statement regarding the service life can be made.

2.5 **Environmental testing**
Humidity: Sensors consist of electronic and, in some cases, optical components. Condensation has to be prevented or removed prior to startup, even when this is not explicitly stated. In the case of optical encoders, condensation and humidity can cause stains and thus lead to signal errors.

3. Parameters that deviate from or supplement the data sheet can be determined and then become part of the systematically performed inspection, as customer specification. Inspection certificates are supplied, if agreed upon in advance.

For your personal notes

Brushed DC motors with ironless windings

Explanations of maxon terminology: DC motor

maxon

Dimensional drawings
Presentation of the views according to the projection method E (ISO). 
All dimensions in [mm].

Mounting in plastic
Screwed connections on motors with plastic flanges require special attention.

M_A **Max. tightening torque** [Ncm]
A torque screw driver may be adjusted to this value.

L **Active depth of screw connection** [mm]
The depth of the screw connection must be less than the usable length of the thread!

Motor Data
The values stated are based on a motor temperature of 25°C (so-called cold data).

1 **Nominal voltage** U_N [Volt]
is the DC voltage on the motor connections on which all nominal data are based (lines 2–9). Lower and higher voltages are permissible, provided set limits are not exceeded.

2 **No load speed** n_0 [rpm] ±10%
This is the speed at which the motor turns at nominal voltage and without load. It is approximately proportional to the applied voltage.

3 **No load current** I_0 [mA] ±50%
This is the typical current that the unloaded motor draws when operating at nominal voltage. It depends on brush friction and friction in the bearings, and also increases with rising speed. No load friction depends heavily on temperature, particularly with precious metal commutation. In extended operation, no load friction decreases and increases at lower temperatures.

4 **Nominal speed** n_N [rpm]
is the speed set for operation at nominal voltage and nominal torque at a motor temperature of 25°C.

5 **Nominal torque** M_N [mNm]
is the torque generated for operation at nominal voltage and nominal current at a motor temperature of 25°C. It is at the limit of the motor's continuous operation range. Higher torques heat up the winding too much.

6 **Nominal current** I_N [A]
is the current that, at 25°C ambient temperature, heats the winding up to the maximum permissible temperature (= max. permissible continuous current). I_N decreases as speed increases due to additional friction losses.

7 **Stall torque** M_H [mNm]
is the calculated load torque that causes the shaft to stop at nominal voltage. Rising motor temperatures reduce stall torque.

8 **Stall current** I_A [A]
is the quotient from nominal voltage and the motor's terminal resistance. Stall current is equivalent to stall torque. With larger motors, I_A can often not be reached due to the amplifier's current limits.

9 **Max. efficiency** η_{max} [%]
is the optimal relationship between input and output power at nominal voltage. It also doesn't always denote the optimal operating point.

10 **Terminal resistance** R [Ω]
is the resistance at the terminals at 25°C and determines the stall current at a given voltage. For graphite brushes, it should be noted that resistance is load-dependent and the value only applies to large currents.

11 **Terminal inductance** L [mH]
is the winding inductance when stationary and measured at 1 kHz, sinusoidal.

12 **Torque constant** k_M [mNm/A]
This may also be referred to as "specific torque" and represents the quotient from generated torque and applicable current.

13 **Speed constant** k_n [rpm/V]
shows the ideal no load speed per 1 volt of applied voltage. Friction losses not taken into account.

14 **Speed / torque gradient**
$\Delta n / \Delta M$ [rpm/mNm]
The speed / torque gradient is an indicator of the motor's performance. The smaller the value, the more powerful the motor and consequently the less motor speed varies with load variations. It is based on the quotient of ideal no load speed and ideal stall torque.

15 **Mechanical time constant**
τ_m [ms]
is the time required for the rotor to accelerate from standstill to 63% of its no load speed.

16 **Rotor inertia** J_R [gcm^2]
is the mass moment of inertia of the rotor, based on the axis of rotation.

17 **Thermal resistance housing-ambient** R_{th2} [K/W]
and
18 **Thermal resistance winding-housing** R_{th1} [K/W]
Characteristic values of thermal contact resistance without additional heat sinking. Lines 17 and 18 combined define the maximum heating at a given power loss (load). Thermal resistance R_{th2} on motors with metal flanges can decrease by up to 80% if the motor is coupled directly to a good heat-conducting (e.g. metallic) mounting rather than a plastic panel.

19 **Thermal time constant winding** τ_w [s]
and
20 **Thermal time constant motor** τ_s [s]
These are the typical reaction times for a temperature change of winding and motor. It can be seen that the motor reacts much more sluggishly in thermal terms than the winding.The values are calculated from the product of thermal capacity and given heat resistances.

21 **Ambient temperature** [°C]
Operating temperature range. This derives from the heat reliability of the materials used and viscosity of bearing lubrication.

22 **Max. winding temperature** [°C]
Maximum permissible winding temperature.

23 **Max. speed** n_{max} [rpm]
is the maximum recommended speed based on thermal and mechanical perspectives. A reduced service life can be expected at higher speeds.

24 **Axial play** [mm]
On motors that are not preloaded, these are the tolerance limits for the bearing play. A preload cancels out the axial play up to the specified axial force. When load is applied in the direction of the preload force (away from the flange), the axial play is always zero. The length tolerance of the shaft includes the maximum axial play.

25 **Radial play** [mm]
Radial play is the bearing's radial movement. A spring is utilized to preload the motor's bearings, eliminating radial play up to a given axial load.

26/27 **Max. axial load** [N]
Dynamically: axial load permissible in operation. If different values apply for traction and thrust, the smaller value is given.
Statically: maximum axial force applying to the shaft at standstill where no residual damage occurs.
Shaft supported: maximum axial force applying to the shaft at standstill if the force is not input at the other shaft end.This is not possible for motors with only one shaft end.

28 **Max. radial load** [N]
The value is given for a typical clearance from the flange; this value falls the greater the clearance.

29 **Number of pole pairs**
Number of north poles of the permanent magnet. The phase streams and commutation signals pass through per revolution p cycles. Servo-controllers require the correct details of the number of pole pairs.

30 **Number of commutator segments**

31 **Weight of motor** [g]

32 **Typical noise level** [dBA]
is that statistical average of the noise level measured according to maxon standard (10 cm distance radially to the drive, no load operation at a speed of 6000 rpm. The drive lies freely on a plastic foam mat in the noise chamber).
The acoustic noise level depends on a number of factors, such as component tolerances, and it is greatly influenced by the overall system in which the drive is installed. When the drive is installed in an unfavorable constellation, the noise level may be significantly higher than the noise level of the drive alone.
The acoustic noise level is measured and determined during product qualification. In manufacturing, a structure-borne noise test is performed with defined limits. Impermissible deviations can thus be identified.

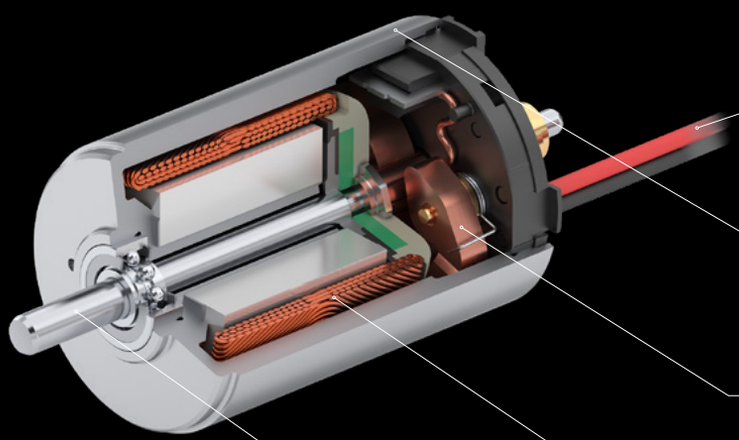
maxon DCX

maxon DCX

The maxon DCX brushed motors feature unrivaled torque density and quiet running. The robust design and the ironless maxon rotor make the DCX motors a dynamic drive for almost all applications. Choose between graphite and precious metal brushes, sintered and ball bearings, and many other components.

Key data

Motor ∅	6 ... 35 mm
Motor length	15.6 ... 72 mm
Power	0.3 ... 80 W
Nominal torque	up to 138 mNm
Max. permissible speed	up to 18 000 rpm



Electrical connection with terminals, cables and connectors, depending on the size.

External/internal magnetic return as a single part. Motor housing and magnet glued together. Sintered bearings or ball bearings.

Commutation with precious metal brushes for delicate rotary motion or graphite brushes for heavy-duty use.

Highly efficient ironless winding, different nominal voltages are available.

Stainless steel shaft with high stiffness; various modification options are available.

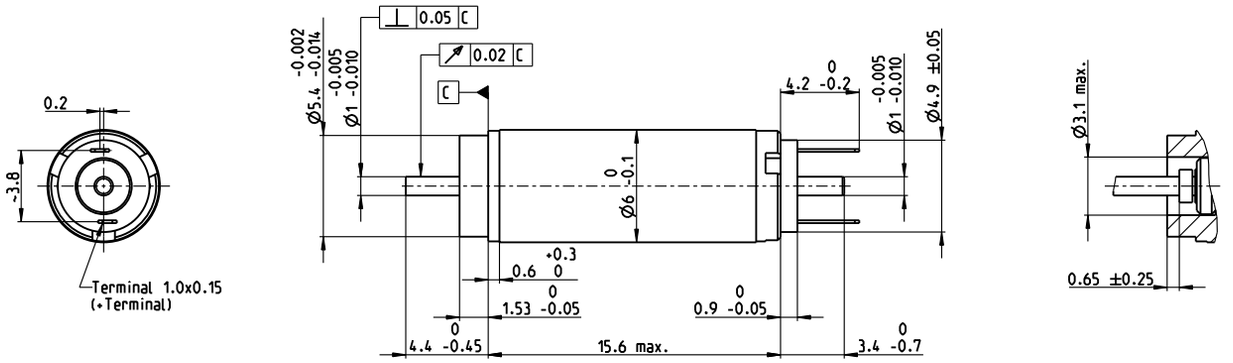
- → Compact and light design
- → Precious metal brushes guarantee a low, constant contact resistance during the entire service life
- → Easy torque control using the current
- → Low start-up voltage, even after a long period in standstill
- → Easily configured online

shop.maxongroup.com

DCX 6 M Precious Metal Brushes
DC motor ∅6 mm

Key Data: 0.3/0.56 W, 0.3 mNm, 17300 rpm

DCX

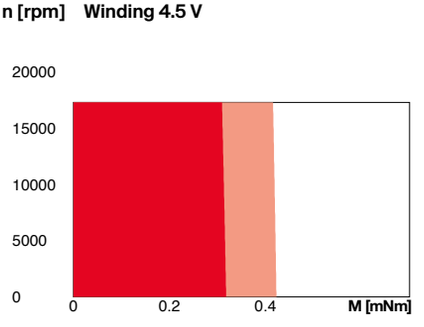


M 5:2

	Motor Data					
1_	Nominal voltage	V	1.5	3	4.5	6
2_	No load speed	rpm	17300	17500	17400	17400
3_	No load current	mA	34.1	17.1	11.4	8.54
4_	Nominal speed	rpm	4950	5940	5730	5690
5_	Nominal torque (max. continuous torque)	mNm	0.309	0.332	0.326	0.325
6_	Nominal current (max. continuous current)	A	0.425	0.228	0.149	0.111
7_	Stall torque	mNm	0.453	0.524	0.507	0.503
8_	Stall current	A	0.581	0.336	0.217	0.161
9_	Max. efficiency	%	58	61	60	60
10_	Terminal resistance	Ω	2.58	9.0	20.8	37.2
11_	Terminal inductance	mH	0.008	0.0316	0.0711	0.126
12_	Torque constant	mNm/A	0.779	1.560	2.34	3.12
13_	Speed constant	rpm/V	12300	6130	4090	3060
14_	Speed/torque gradient	rpm/mNm	40600	35100	36300	36600
15_	Mechanical time constant	ms	7.06	6.74	6.81	6.81
16_	Rotor inertia	gcm²	0.017	0.0183	0.0179	0.018

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	105
18_	Thermal resistance winding-housing	K/W	20
19_	Thermal time constant winding	s	1.71
20_	Thermal time constant motor	s	79
21_	Ambient temperature ball bearings	°C	-30...+85
	Ambient temperature sleeve bearings	°C	-30...+85
22_	Max. winding temperature	°C	100
	Mechanical data ball bearings		
23_	Max. speed	rpm	17300
24_	Axial play	mm	0...0.1
	Preload	N	0.5
25_	Radial play	mm	0.012
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	8.8
	(static, shaft supported)	N	100
28_	Max. radial load [mm from flange]	N	0.6 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	17300
24_	Axial play	mm	0.02...0.1
	Preload	N	0
25_	Radial play	mm	0.012
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	10
	(static, shaft supported)	N	100
28_	Max. radial load [mm from flange]	N	0.4 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		5
31_	Weight of motor	g	2.4
32_	Typical noise level	dBA	–

Operating Range



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
321_GPX 6 A	1–5	429_ENX 6 MAG	486_ESCON Module 24/2 486_ESCON 36/2 DC 498_EPOS4 Mod./Comp. 24/1.5

Configuration

Bearing: Sleeve bearings/ball bearings preloaded
Commutation: Precious metal brushes
Flange front/back: Standard flange
Shaft front/back: Length
Electric connection: Terminals or cables (encoder always with Flex)

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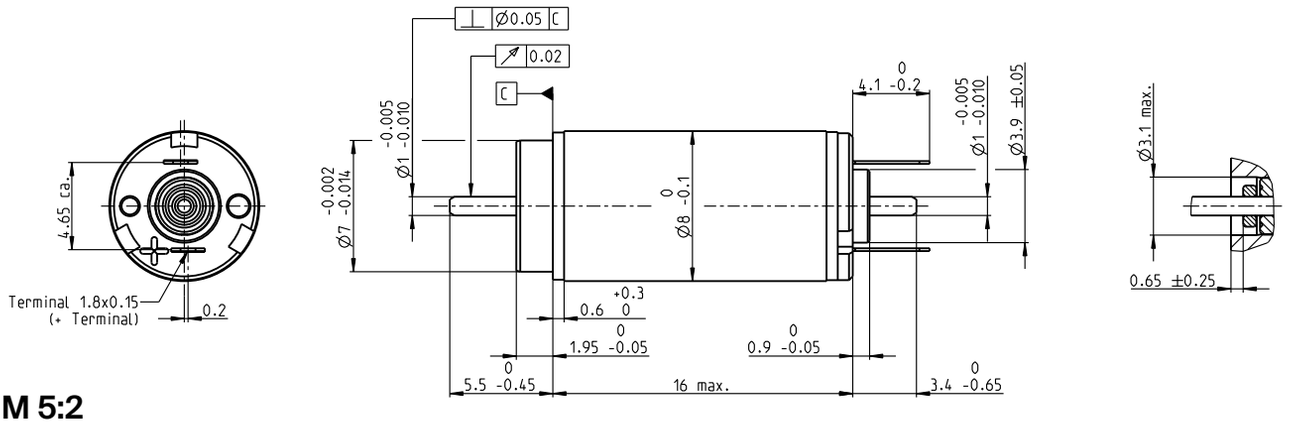
DCX 8 M Precious Metal Brushes
DC motor ∅8 mm

DCX

Key Data: 0.5/1.0 W, 0.65 mNm, 17300 rpm



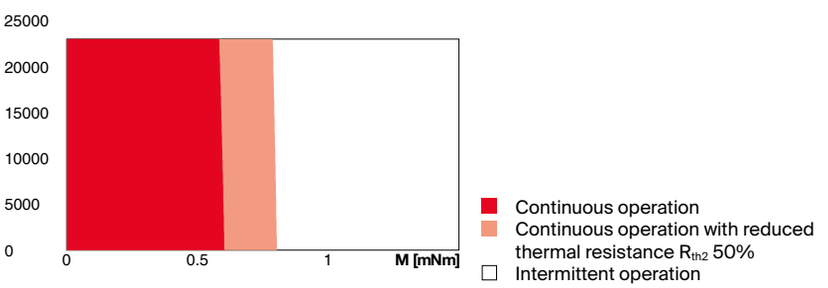
M 5:2

	Motor Data							
1_	Nominal voltage	V	2.4	4.2	6	7.2	9	12
2_	No load speed	rpm	11500	11700	11000	11900	11900	12900
3_	No load current	mA	11.9	6.93	4.51	4.12	3.3	2.74
4_	Nominal speed	rpm	4780	4950	4190	4820	5190	5800
5_	Nominal torque (max. continuous torque)	mNm	0.653	0.649	0.641	0.62	0.652	0.614
6_	Nominal current (max. continuous current)	A	0.345	0.199	0.13	0.113	0.0949	0.0728
7_	Stall torque	mNm	1.13	1.14	1.05	1.06	1.17	1.13
8_	Stall current	A	0.581	0.34	0.207	0.187	0.166	0.13
9_	Max. efficiency	%	74	74	73	73	74	74
10_	Terminal resistance	Ω	4.13	12	29	38.5	54.3	92.2
11_	Terminal inductance	mH	0.014	0.0411	0.0941	0.117	0.183	0.276
12_	Torque constant	mNm/A	1.95	3.360	5.08	5.67	7.07	8.71
13_	Speed constant	rpm/V	4900	2850	1880	1680	1350	1100
14_	Speed/torque gradient	rpm/mNm	10400	10500	10700	11400	10400	11600
15_	Mechanical time constant	ms	4.17	4.15	4.18	4.24	4.15	4.28
16_	Rotor inertia	gcm²	0.038	0.0379	0.0372	0.035	0.038	0.035

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	101
18_	Thermal resistance winding-housing	K/W	16.9
19_	Thermal time constant winding	s	2.31
20_	Thermal time constant motor	s	162
21_	Ambient temperature ball bearings	°C	-30...+85
	Ambient temperature sleeve bearings	°C	-30...+85
22_	Max. winding temperature	°C	100
	Mechanical data ball bearings		
23_	Max. speed	rpm	17300
24_	Axial play	mm	0...0.1
	Preload	N	0.5
25_	Radial play	mm	0.012
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	8.8
	(static, shaft supported)	N	100
28_	Max. radial load [mm from flange]	N	0.6 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	17300
24_	Axial play	mm	0.02...0.1
	Preload	N	0
25_	Radial play	mm	0.012
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	10
	(static, shaft supported)	N	100
28_	Max. radial load [mm from flange]	N	0.4 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		5
31_	Weight of motor	g	4.4
32_	Typical noise level	dBA	–

Operating Range

n [rpm] Winding 6 V



maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
322_GPX 8 A	1–5	430_ENX 8 MAG	486_ESCON Module 24/2 486_ESCON 36/2 DC 498_EPOS4 Mod./Comp. 24/1.5

Configuration

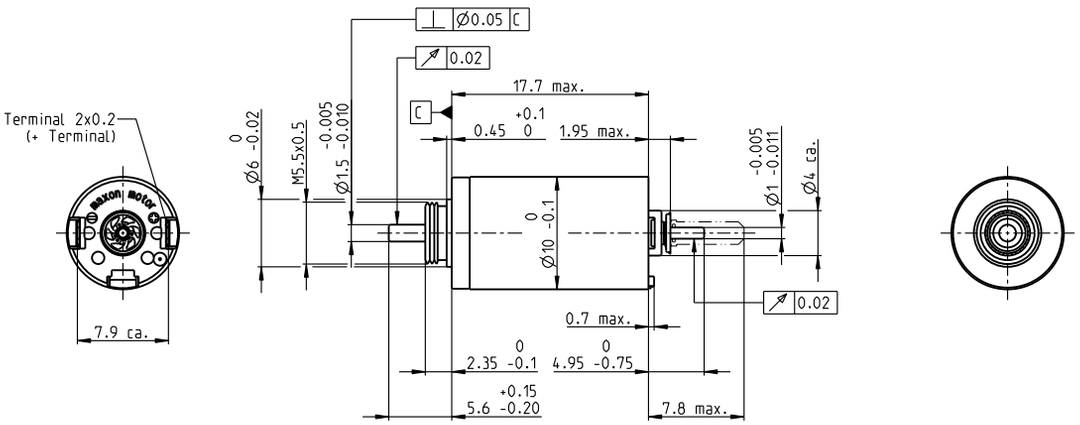
Bearing: Sleeve bearings/ball bearings preloaded
Commutation: Precious metal brushes with or without CLL
Flange front/back: Standard flange
Shaft front/back: Length
Electric connection: Terminals or cables (encoder always with Flex)

xdrives.maxongroup.com

DCX 10 S Precious Metal Brushes
DC motor ∅10 mm

DCX

Key Data: 1/1.4 W, 0.9 mNm, 14300 rpm



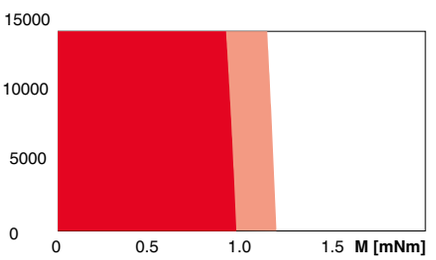
M 3:2

	Motor Data							
1_	Nominal voltage	V	1.5	3	4.5	6	9	12
2_	No load speed	rpm	12600	13000	12600	11400	12600	12500
3_	No load current	mA	84.1	43.8	28	18.2	14	10.5
4_	Nominal speed	rpm	4530	4690	4270	3310	3930	3890
5_	Nominal torque (max. continuous torque)	mNm	0.918	0.948	0.944	0.993	0.909	0.905
6_	Nominal current (max. continuous current)	A	0.924	0.49	0.316	0.223	0.152	0.114
7_	Stall torque	mNm	1.49	1.54	1.48	1.46	1.38	1.37
8_	Stall current	A	1.39	0.742	0.463	0.307	0.215	0.16
9_	Max. efficiency	%	58	58	58	58	56	56
10_	Terminal resistance	Ω	1.08	4.04	9.72	19.5	41.8	74.9
11_	Terminal inductance	mH	0.014	0.051	0.122	0.268	0.488	0.868
12_	Torque constant	mNm/A	1.07	2.07	3.2	4.74	6.4	8.53
13_	Speed constant	rpm/V	8950	4600	2980	2010	1490	1120
14_	Speed/torque gradient	rpm/mNm	9030	8970	9060	8290	9750	9830
15_	Mechanical time constant	ms	7.24	7.19	7.21	7.03	7.27	7.26
16_	Rotor inertia	gcm²	0.077	0.077	0.076	0.081	0.071	0.071

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	37.6
18_	Thermal resistance winding-housing	K/W	22.0
19_	Thermal time constant winding	s	4.69
20_	Thermal time constant motor	s	156
21_	Ambient temperature ball bearings	°C	-40...+85
	Ambient temperature sleeve bearings	°C	-30...+85
22_	Max. winding temperature	°C	100
	Mechanical data ball bearings		
23_	Max. speed	rpm	14300
24_	Axial play	mm	0...0.1
	Preload	N	0.5
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.5
27_	Max. force for press fits (static)	N	8.8
	(static, shaft supported)	N	120
28_	Max. radial load [mm from flange]	N	1.5 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	14300
24_	Axial play	mm	0...0.15
	Preload	N	0
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	30
	(static, shaft supported)	N	120
28_	Max. radial load [mm from flange]	N	0.8 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		7
31_	Weight of motor	g	6.3
32_	Typical noise level	dBA	35

Operating Range

n [rpm] Winding 4.5 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
323_GPX 10 A	1–5	433_ENX 10 EASY	486_ESCON Module 24/2
		433_ENX 10 QUAD	486_ESCON 36/2 DC
		434_ENX 10 EASY XT	498_EPOS4 Mod./Comp. 24/1.5

Configuration

Bearing: Sleeve bearings/ball bearings preloaded
Commutation: Precious metal brushes with or without CLL
Flange front/back: Standard flange/Flange with thread holes/no flange
Shaft front/back: Length
Electric connection: Terminals or cable/cable length/connector type

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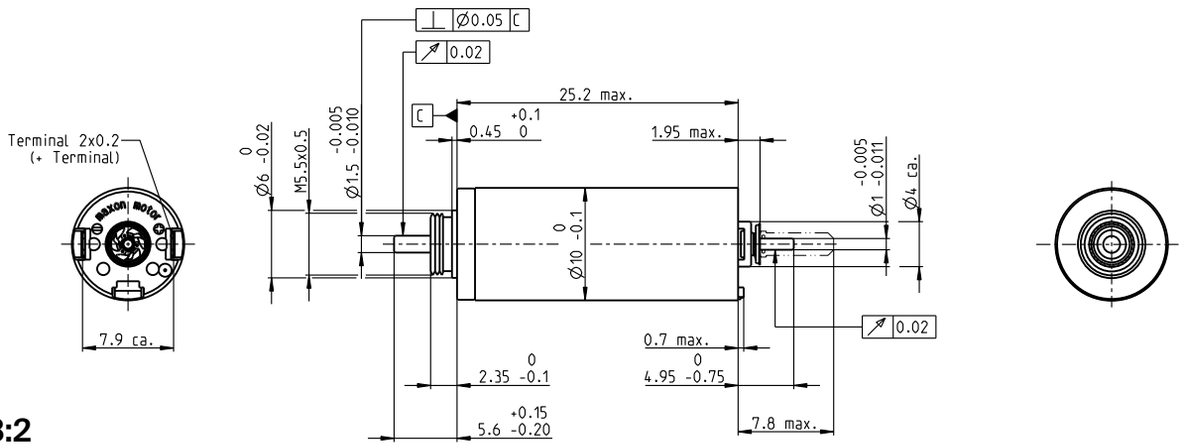
DCX 10 L Precious Metal Brushes
DC motor ∅10 mm

DCX

Key Data: 1.5/3 W, 2.2 mNm, 14300 rpm



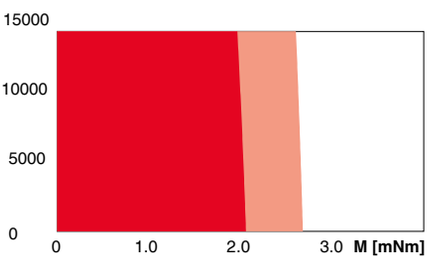
M 3:2

	Motor Data							
1_	Nominal voltage	V	1.5	3	4.5	6	9	12
2_	No load speed	rpm	11600	12200	12000	12200	12000	11300
3_	No load current	mA	72.1	38.7	25.2	19.3	12.6	8.71
4_	Nominal speed	rpm	9230	6930	7110	6640	6780	5980
5_	Nominal torque (max. continuous torque)	mNm	1.04	2.05	2.2	1.94	2.06	2.03
6_	Nominal current (max. continuous current)	A	0.924	0.922	0.648	0.436	0.304	0.211
7_	Stall torque	mNm	5.13	4.81	5.45	4.32	4.8	4.36
8_	Stall current	A	4.23	2.09	1.55	0.937	0.682	0.439
9_	Max. efficiency	%	75	75	77	74	75	74
10_	Terminal resistance	Ω	0.355	1.44	2.9	6.4	13.2	27.3
11_	Terminal inductance	mH	0.005	0.020	0.045	0.078	0.181	0.362
12_	Torque constant	mNm/A	1.21	2.31	3.52	4.61	7.04	10.0
13_	Speed constant	rpm/V	7870	4140	2710	2070	1360	960
14_	Speed/torque gradient	rpm/mNm	2300	2590	2240	2880	2550	2640
15_	Mechanical time constant	ms	3.68	3.57	3.54	3.58	3.56	3.59
16_	Rotor inertia	gcm²	0.153	0.132	0.151	0.119	0.134	0.130

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	36.5
18_	Thermal resistance winding-housing	K/W	10.6
19_	Thermal time constant winding	s	3.94
20_	Thermal time constant motor	s	151
21_	Ambient temperature ball bearings	°C	-40...+85
	Ambient temperature sleeve bearings	°C	-30...+85
22_	Max. winding temperature	°C	100
	Mechanical data ball bearings		
23_	Max. speed	rpm	14300
24_	Axial play	mm	0...0.1
	Preload	N	0.5
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.5
27_	Max. force for press fits (static)	N	8.8
	(static, shaft supported)	N	120
28_	Max. radial load [mm from flange]	N	1.5 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	14300
24_	Axial play	mm	0...0.15
	Preload	N	0
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	30
	(static, shaft supported)	N	120
28_	Max. radial load [mm from flange]	N	0.8 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		7
31_	Weight of motor	g	11
32_	Typical noise level	dBA	37

Operating Range

n [rpm] Winding 4.5 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
323_GPX 10 A	1–5	433_ENX 10 EASY	486_ESCON Module 24/2
		433_ENX 10 QUAD	486_ESCON 36/2 DC
		434_ENX 10 EASY XT	498_EPOS4 Mod./Comp. 24/1.5

Configuration

Bearing: Sleeve bearings/ball bearings preloaded
Commutation: Precious metal brushes with or without CLL
Flange front/back: Standard flange/Flange with thread holes/no flange
Shaft front/back: Length
Electric connection: Terminals or cable/cable length/connector type

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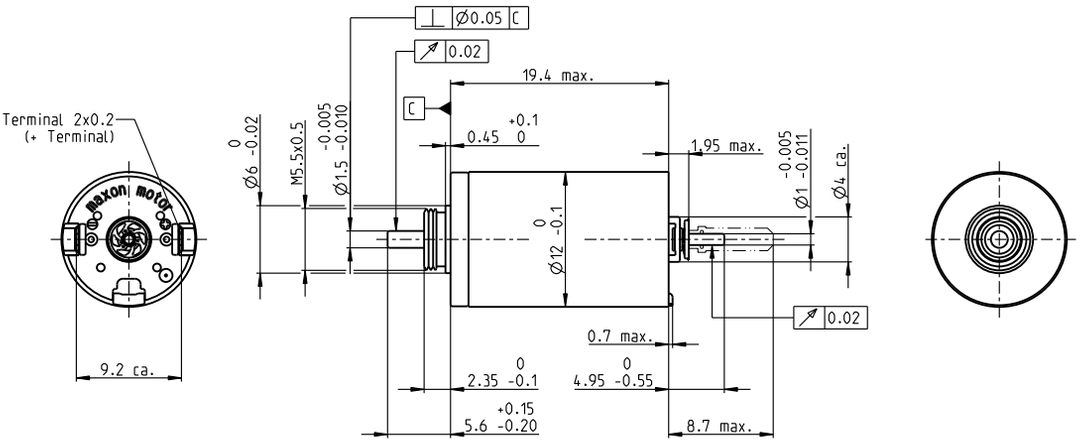
DCX 12 S Precious Metal Brushes
DC motor ∅12 mm

Key Data: 1.6/2 W, 2.0 mNm, 13 000 rpm

DCX



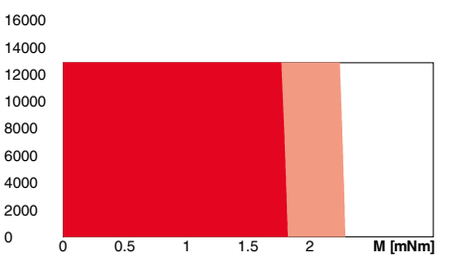
M 3:2

	Motor Data						
1_	Nominal voltage	V	3	4.5	6	9	12
2_	No load speed	rpm	9090	9000	9100	9010	9020
3_	No load current	mA	31.8	20.9	15.9	10.5	7.88
4_	Nominal speed	rpm	3760	3620	3870	3700	3620
5_	Nominal torque (max. continuous torque)	mNm	1.92	1.9	1.95	1.92	1.88
6_	Nominal current (max. continuous current)	A	0.655	0.427	0.332	0.216	0.159
7_	Stall torque	mNm	3.35	3.25	3.46	3.33	3.21
8_	Stall current	A	1.09	0.701	0.566	0.36	0.261
9_	Max. efficiency	%	69	69	70	69	69
10_	Terminal resistance	Ω	2.74	6.42	10.6	25	46
11_	Terminal inductance	mH	0.0724	0.166	0.29	0.664	1.17
12_	Torque constant	mNm/A	3.06	4.63	6.12	9.26	12.3
13_	Speed constant	rpm/V	3120	2060	1560	1030	775
14_	Speed/torque gradient	rpm/mNm	2800	2860	2700	2780	2890
15_	Mechanical time constant	ms	8.37	8.32	8.31	8.33	8.33
16_	Rotor inertia	gcm²	0.286	0.278	0.293	0.286	0.275

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	35
18_	Thermal resistance winding-housing	K/W	14.4
19_	Thermal time constant winding	s	7.18
20_	Thermal time constant motor	s	146
21_	Ambient temperature ball bearings	°C	-40...+85
	Ambient temperature sleeve bearings	°C	-30...+85
22_	Max. winding temperature	°C	100
	Mechanical data ball bearings		
23_	Max. speed	rpm	13 000
24_	Axial play	mm	0...0.1
	Preload	N	0.5
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.5
27_	Max. force for press fits (static)	N	8.8
	(static, shaft supported)	N	120
28_	Max. radial load [mm from flange]	N	1.5 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	13 000
24_	Axial play	mm	0...0.15
	Preload	N	0
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	30
	(static, shaft supported)	N	120
28_	Max. radial load [mm from flange]	N	0.8 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		7
31_	Weight of motor	g	11
32_	Typical noise level	dBA	40

Operating Range

n [rpm] Winding 4.5 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
324_GPX 12 A/C	1–4	433_ENX 10 EASY	486_ESCON Module 24/2
325_GPX 12 LN/LZ	1–4	433_ENX 10 QUAD	486_ESCON 36/2 DC
326_GPX 12 HP	2–4	434_ENX 10 EASY XT	498_EPOS4 Mod./Comp. 24/1.5
328_GPX 14 A/C	3–4		
329_GPX 14 LN/LZ	3–4		
330_GPX 14 HP	4		

Configuration

Bearing: Sleeve bearings/ball bearings preloaded
Commutation: Precious metal brushes with or without CLL
Flange front/back: Standard flange/Flange with thread holes/no flange
Shaft front/back: Length
Electric connection: Terminals or cable/cable length/connector type

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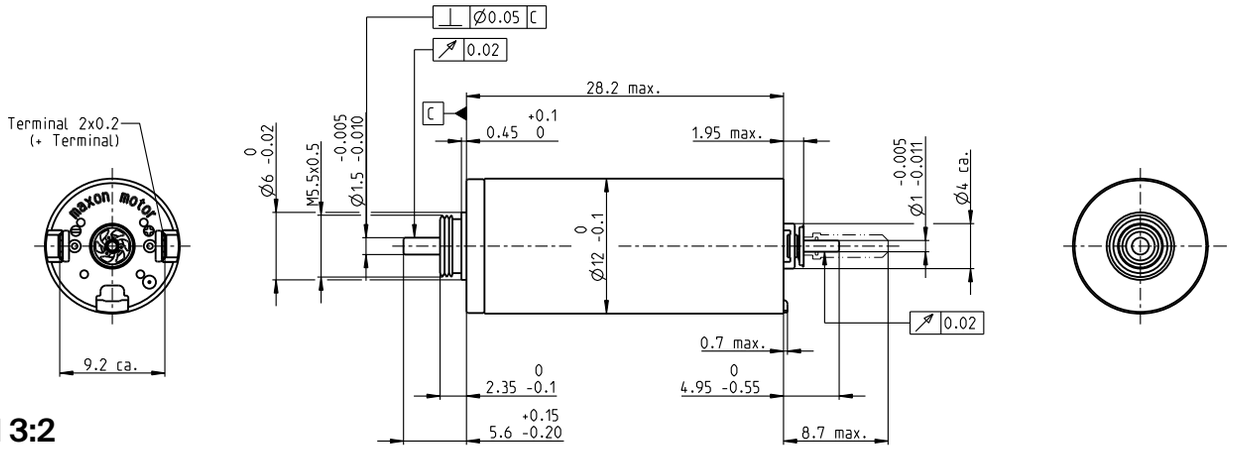
DCX 12 L Precious Metal Brushes
DC motor ∅12 mm

DCX

Key Data: 2.5/4.8 W, 4.2 mNm, 12 000 rpm



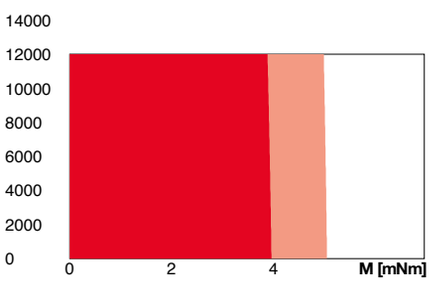
M 3:2

	Motor Data							
1_	Nominal voltage	V	3	4.5	6	9	12	18
2_	No load speed	rpm	8810	8820	8810	8820	8810	8810
3_	No load current	mA	31.3	20.9	15.7	10.4	7.83	5.22
4_	Nominal speed	rpm	6230	5640	5540	5750	5560	5540
5_	Nominal torque (max. continuous torque)	mNm	2.88	4.02	3.88	4.13	3.89	3.87
6_	Nominal current (max. continuous current)	A	0.924	0.851	0.616	0.437	0.309	0.205
7_	Stall torque	mNm	9.9	11.2	10.5	11.9	10.6	10.5
8_	Stall current	A	3.08	2.32	1.63	1.23	0.824	0.543
9_	Max. efficiency	%	81	82	82	83	82	82
10_	Terminal resistance	Ω	0.975	1.94	3.68	7.29	14.6	33.1
11_	Terminal inductance	mH	0.031	0.071	0.125	0.282	0.502	1.13
12_	Torque constant	mNm/A	3.22	4.83	6.44	9.66	12.9	19.3
13_	Speed constant	rpm/V	2970	1980	1480	989	741	494
14_	Speed/torque gradient	rpm/mNm	898	793	846	746	839	848
15_	Mechanical time constant	ms	4.55	4.43	4.4	4.37	4.38	4.39
16_	Rotor inertia	gcm²	0.484	0.533	0.496	0.559	0.498	0.495

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	31
18_	Thermal resistance winding-housing	K/W	10.3
19_	Thermal time constant winding	s	10.1
20_	Thermal time constant motor	s	194
21_	Ambient temperature ball bearings	°C	-40...+85
	Ambient temperature sleeve bearings	°C	-30...+85
22_	Max. winding temperature	°C	100
	Mechanical data ball bearings		
23_	Max. speed	rpm	12 000
24_	Axial play	mm	0...0.1
	Preload	N	0.5
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.5
27_	Max. force for press fits (static)	N	8.8
	(static, shaft supported)	N	120
28_	Max. radial load [mm from flange]	N	1.5 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	12 000
24_	Axial play	mm	0...0.15
	Preload	N	0
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	30
	(static, shaft supported)	N	120
28_	Max. radial load [mm from flange]	N	0.8 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		7
31_	Weight of motor	g	16
32_	Typical noise level	dBA	44

Operating Range

n [rpm] **Winding 4.5 V**



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
324_GPX 12 A/C	1–4	433_ENX 10 EASY	486_ESCON Module 24/2
325_GPX 12 LN/LZ	1–4	433_ENX 10 QUAD	486_ESCON 36/2 DC
326_GPX 12 HP	2–4	434_ENX 10 EASY XT	498_EPOS4 Mod./Comp. 24/1.5
328_GPX 14 A/C	3–4		
329_GPX 14 LN/LZ	3–4		
330_GPX 14 HP	4		

Configuration

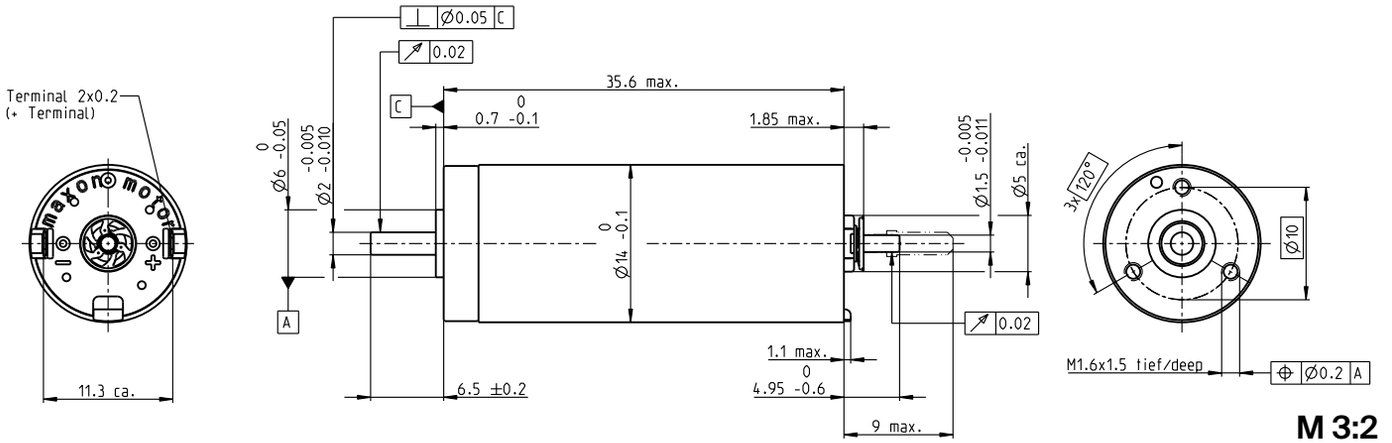
Bearing: Sleeve bearings/ball bearings preloaded
Commutation: Precious metal brushes with or without CLL
Flange front/back: Standard flange/Flange with thread holes/no flange
Shaft front/back: Length
Electric connection: Terminals or cable/cable length/connector type

xdrives.maxongroup.com

DCX 14 L Precious Metal Brushes
DC motor ∅14 mm

Key Data: 3/5 W, 6.3 mNm, 8680 rpm

DCX



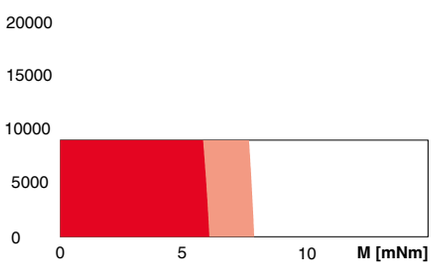
M 3:2

	Motor Data								
1_	Nominal voltage	V	3	4.5	6	9	12	18	24
2_	No load speed	rpm	7720	7740	7740	7740	7740	7730	7740
3_	No load current	mA	73.6	49.1	36.8	24.5	18.4	12.2	9.2
4_	Nominal speed	rpm	5770	5160	5140	5200	5200	5040	5150
5_	Nominal torque (max. continuous torque)	mNm	4.12	6.29	6.23	6.37	6.38	6.01	6.24
6_	Nominal current (max. continuous current)	A	1.2	1.2	0.889	0.605	0.454	0.286	0.223
7_	Stall torque	mNm	16.5	19.1	18.8	19.6	19.7	17.5	18.9
8_	Stall current	A	4.52	3.49	2.57	1.79	1.35	0.799	0.647
9_	Max. efficiency	%	76	77.7	77.6	78	78.1	77	77.7
10_	Terminal resistance	Ω	0.664	1.29	2.33	5.02	8.9	22.5	37.1
11_	Terminal inductance	mH	0.0252	0.0567	0.101	0.227	0.403	0.908	1.61
12_	Torque constant	mNm/A	3.65	5.47	7.3	10.9	14.6	21.9	29.2
13_	Speed constant	rpm/V	2620	1740	1310	872	654	436	327
14_	Speed/torque gradient	rpm/mNm	476	411	418	400	399	449	415
15_	Mechanical time constant	ms	4.14	4.06	4.05	4.04	4.05	4.1	4.09
16_	Rotor inertia	gcm²	0.831	0.942	0.926	0.966	0.97	0.872	0.939

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	22.2
18_	Thermal resistance winding-housing	K/W	8.63
19_	Thermal time constant winding	s	10.3
20_	Thermal time constant motor	s	226
21_	Ambient temperature ball bearings	°C	-40...+85
	Ambient temperature sleeve bearings	°C	-30...+85
22_	Max. winding temperature	°C	100
	Mechanical data ball bearings		
23_	Max. speed	rpm	8680
24_	Axial play	mm	0...0.1
	Preload	N	0.8
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.8
27_	Max. force for press fits (static)	N	18
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	10 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	8680
24_	Axial play	mm	0...0.2
	Preload	N	0
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	60
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	2 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		7
31_	Weight of motor	g	26
32_	Typical noise level	dBA	44

Operating Range

n [rpm] Winding 9 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
328_GPX 14 A/C	1–2 [3–4]	433_ENX 10 EASY	486_ESCON Module 24/2
329_GPX 14 LN/LZ	1–2 [3–4]	433_ENX 10 QUAD	486_ESCON 36/2 DC
330_GPX 14 HP	2–3 [4]	434_ENX 10 EASY XT	498_EPOS4 Mod./Comp. 24/1.5
331_GPX 16 A/C	3–4		
332_GPX 16 LN/LZ	3–4		
333_GPX 16 HP	4		

Configuration

Bearing: Ball bearings preloaded/sleeve bearings
Commutation: Precious metal brushes with CLL/graphite brushes
Flange front/back: Standard flange/configurable flange/no flange
Shaft front/back: Length/diameter/flat face
Electric connection: Terminals or cable/alignment of connection/cable length/connector type

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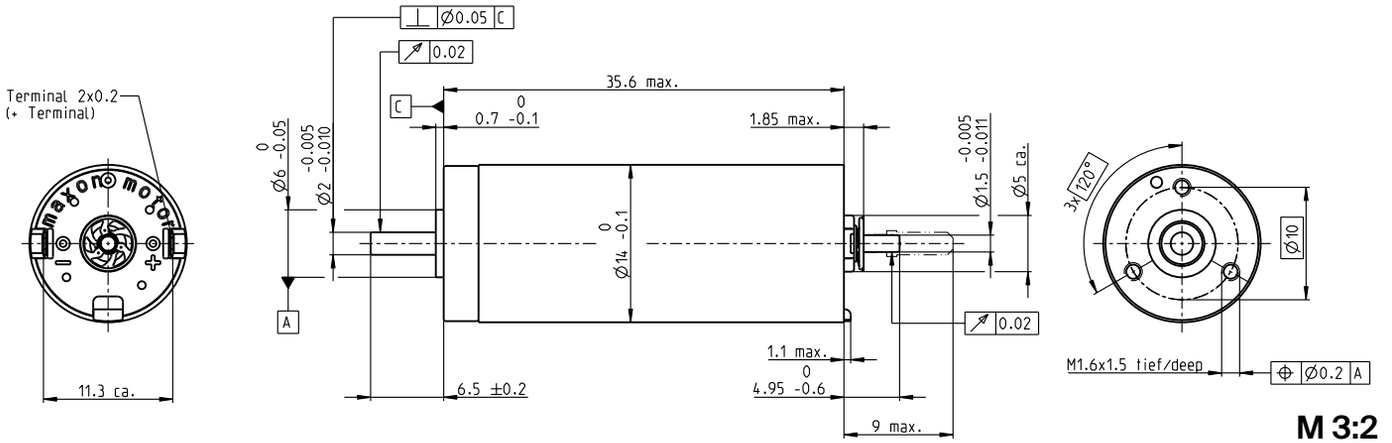
DCX 14 L Graphite Brushes
DC motor ∅14 mm

DCX

Key Data: 6/10 W, 6.9 mNm, 17000 rpm



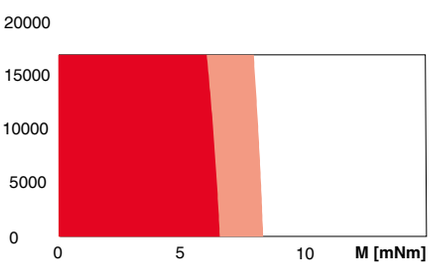
M 3:2

	Motor Data							
1_	Nominal voltage	V	4.5	6	9	12	18	24
2_	No load speed	rpm	11600	10400	11700	10300	11600	10300
3_	No load current	mA	73.9	46.4	37	23.2	18.5	11.6
4_	Nominal speed	rpm	8460	7430	8750	7370	8760	7300
5_	Nominal torque (max. continuous torque)	mNm	6.36	6.96	6.88	6.91	6.94	6.66
6_	Nominal current (max. continuous current)	A	1.81	1.31	0.974	0.651	0.492	0.314
7_	Stall torque	mNm	23.5	24.8	27.8	24.7	28.5	22.9
8_	Stall current	A	6.45	4.53	3.8	2.26	1.95	1.05
9_	Max. efficiency	%	79.5	80.8	81.4	80.1	81.3	80.1
10_	Terminal resistance	Ω	0.698	1.33	2.37	5.31	9.21	22.9
11_	Terminal inductance	mH	0.0252	0.0567	0.101	0.227	0.403	0.908
12_	Torque constant	mNm/A	3.65	5.47	7.3	10.9	14.6	21.9
13_	Speed constant	rpm/V	2620	1740	1310	872	654	436
14_	Speed/torque gradient	rpm/mNm	500	422	424	423	413	456
15_	Mechanical time constant	ms	4.35	4.17	4.11	4.28	4.19	4.17
16_	Rotor inertia	gcm²	0.831	0.942	0.926	0.966	0.97	0.872

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	22.2
18_	Thermal resistance winding-housing	K/W	8.63
19_	Thermal time constant winding	s	10.3
20_	Thermal time constant motor	s	226
21_	Ambient temperature ball bearings	°C	-40...+100
	Ambient temperature sleeve bearings	°C	-30...+100
22_	Max. winding temperature	°C	125
	Mechanical data ball bearings		
23_	Max. speed	rpm	17000
24_	Axial play	mm	0...0.1
	Preload	N	0.8
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.8
27_	Max. force for press fits (static)	N	18
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	10 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	15000
24_	Axial play	mm	0...0.2
	Preload	N	0
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	60
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	2 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		7
31_	Weight of motor	g	26
32_	Typical noise level	dBA	40

Operating Range

n [rpm] Winding 12 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
328_GPX 14 A/C	1–2 [3–4]	433_ENX 10 EASY	486_ESCON Module 24/2
329_GPX 14 LN/LZ	1–2 [3–4]	433_ENX 10 QUAD	486_ESCON 36/2 DC
330_GPX 14 HP	2–3 [4]	434_ENX 10 EASY XT	498_EPOS4 Mod./Comp. 24/1.5
331_GPX 16 A/C	3–4		
332_GPX 16 LN/LZ	3–4		
333_GPX 16 HP	4		

Configuration

Bearing: Ball bearings preloaded/sleeve bearings
Commutation: Precious metal brushes with CLL/graphite brushes
Flange front/back: Standard flange/configurable flange/no flange
Shaft front/back: Length/diameter/flat face
Electric connection: Terminals or cable/alignment of connection/cable length/connector type

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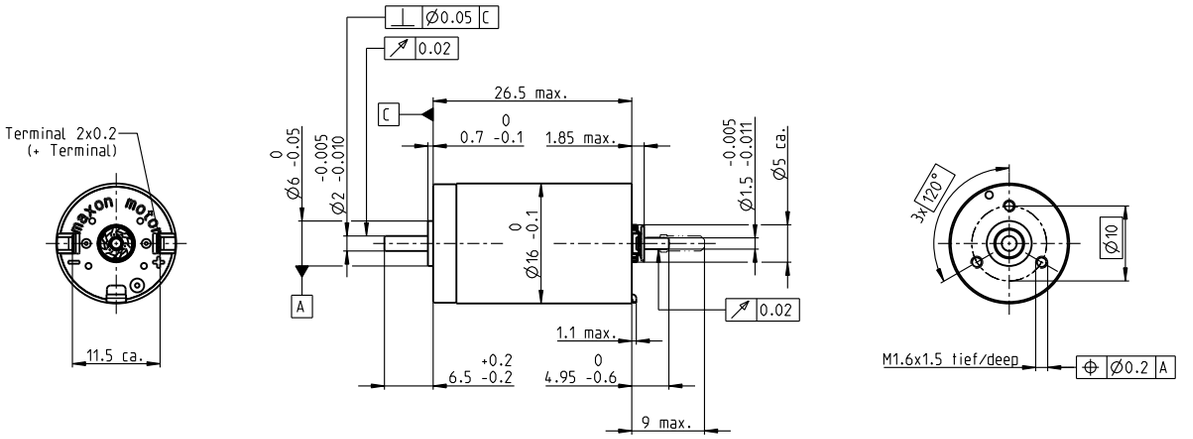
DCX 16 S Precious Metal Brushes
DC motor ∅16 mm

DCX

Key Data: 3/5 W, 5.3 mNm, 8680 rpm



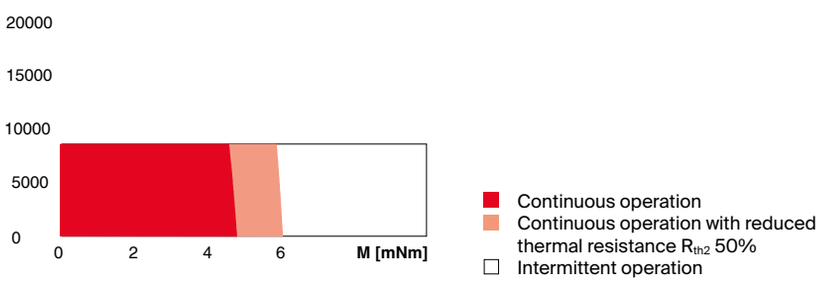
M 1:1

	Motor Data								
1_	Nominal voltage	V	3	4.5	6	9	12	18	24
2_	No load speed	rpm	6320	6320	6610	6320	6260	6340	6250
3_	No load current	mA	44.6	29.7	23.4	14.9	11	7.43	5.51
4_	Nominal speed	rpm	3350	3300	3760	3270	3320	3530	3200
5_	Nominal torque (max. continuous torque)	mNm	5.15	5.05	5.36	5	5.19	5.45	4.99
6_	Nominal current (max. continuous current)	A	1.20	0.784	0.65	0.389	0.299	0.211	0.144
7_	Stall torque	mNm	11.1	10.7	12.6	10.6	11.2	12.5	10.4
8_	Stall current	A	2.49	1.61	1.48	0.791	0.624	0.467	0.289
9_	Max. efficiency	%	75	75	77	75	75	77	74
10_	Terminal resistance	Ω	1.20	2.80	4.06	11.4	19.2	38.6	83.1
11_	Terminal inductance	mH	0.036	0.080	0.131	0.320	0.581	1.28	2.32
12_	Torque constant	mNm/A	4.45	6.67	8.53	13.3	18.0	26.7	36.0
13_	Speed constant	rpm/V	2150	1430	1120	715	531	358	265
14_	Speed/torque gradient	rpm/mNm	580	600	533	610	568	517	613
15_	Mechanical time constant	ms	6.09	6.09	6.05	6.13	6.11	6.08	6.17
16_	Rotor inertia	gcm²	1.00	0.97	1.08	0.959	1.03	1.12	0.960

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	23.5
18_	Thermal resistance winding-housing	K/W	9.9
19_	Thermal time constant winding	s	9.63
20_	Thermal time constant motor	s	227
21_	Ambient temperature ball bearings	°C	-40...+85
	Ambient temperature sleeve bearings	°C	-30...+85
22_	Max. winding temperature	°C	100
	Mechanical data ball bearings		
23_	Max. speed	rpm	8680
24_	Axial play	mm	0...0.1
	Preload	N	0.8
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.8
27_	Max. force for press fits (static)	N	18
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	10 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	8680
24_	Axial play	mm	0...0.2
	Preload	N	0
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	60
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	2 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		7
31_	Weight of motor	g	26
32_	Typical noise level	dBA	40

Operating Range

n [rpm] Winding 12 V



maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
331_GPX 16 A/C	1–2 [3–4]	433_ENX 10 EASY	486_ESCON Module 24/2
332_GPX 16 LN/LZ	1–2 [3–4]	433_ENX 10 QUAD	486_ESCON 36/2 DC
333_GPX 16 HP	2–3 [4]	434_ENX 10 EASY XT	496_EPOS4 Mod. 24/1.5
335_GPX 19 A/C	3–4	436_ENX 16 EASY	498_EPOS4 Comp. 24/1.5
336_GPX 19 LN/LZ	3–4	437_ENX 16 EASY XT	501_EPOS4 50/5
337_GPX 19 HP	4	438_ENX 16 EASY Abs.	
		439_ENX 16 EASY Abs. XT	
		443_ENX 16 RIO	

Configuration

Bearing: Ball bearings preloaded/sleeve bearings
Commutation: Precious metal brushes with CLL/graphite brushes
Flange front/back: Standard flange/configurable flange/no flange
Shaft front/back: Length/diameter/flat face
Electric connection: Terminals or cable/alignment of connection/cable length/connector type

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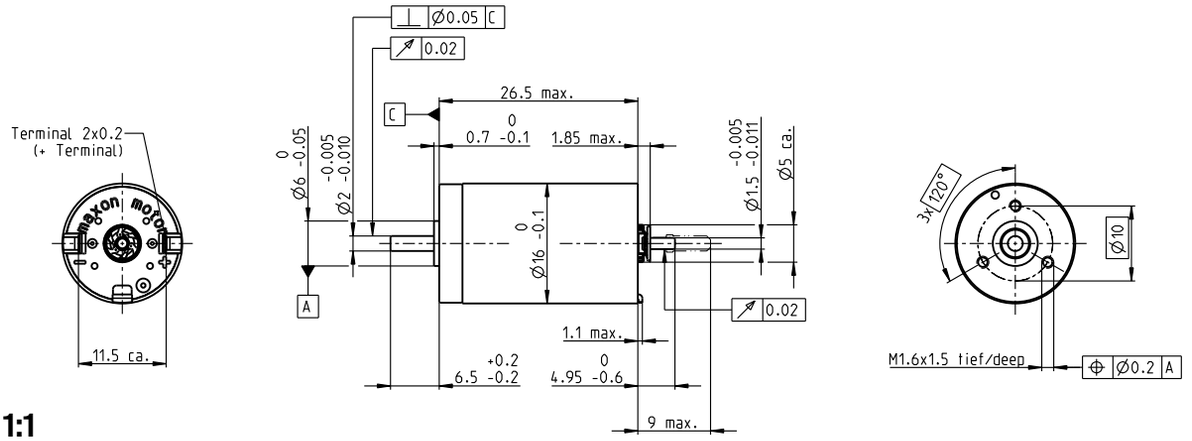
DCX 16 S Graphite Brushes
DC motor ∅16 mm

DCX

Key Data: 5/10 W, 5.4 mNm, 17000 rpm



M 1:1

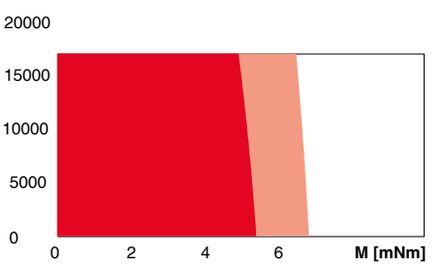
	Motor Data							
1_	Nominal voltage	V	6	9	12	18	24	48
2_	No load speed	rpm	12700	12700	13200	12700	12700	12600
3_	No load current	mA	63.9	42.6	35.4	22.4	16.8	8.28
4_	Nominal speed	rpm	9400	9400	9850	9260	9430	9250
5_	Nominal torque (max. continuous torque)	mNm	5.45	5.4	5.36	5.21	5.43	5.32
6_	Nominal current (max. continuous current)	A	1.28	0.847	0.662	0.411	0.321	0.156
7_	Stall torque	mNm	21.3	21	22.6	20.1	21.7	20.6
8_	Stall current	A	4.79	3.15	2.65	1.51	1.22	0.572
9_	Max. efficiency	%	78	78	76	76	78	77
10_	Terminal resistance	Ω	1.25	2.85	4.53	12	19.7	83.9
11_	Terminal inductance	mH	0.036	0.080	0.131	0.320	0.569	2.32
12_	Torque constant	mNm/A	4.45	6.67	8.53	13.3	17.8	36.0
13_	Speed constant	rpm/V	2150	1430	1120	715	536	265
14_	Speed/torque gradient	rpm/mNm	605	612	594	641	592	620
15_	Mechanical time constant	ms	6.35	6.21	6.74	6.43	6.32	6.23
16_	Rotor inertia	gcm²	1.00	0.970	1.08	0.959	1.02	0.960

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	23.5
18_	Thermal resistance winding-housing	K/W	9.9
19_	Thermal time constant winding	s	9.63
20_	Thermal time constant motor	s	227
21_	Ambient temperature ball bearings	°C	-40...+100
	Ambient temperature sleeve bearings	°C	-30...+100
22_	Max. winding temperature	°C	125
	Mechanical data ball bearings		
23_	Max. speed	rpm	17000
24_	Axial play	mm	0...0.1
	Preload	N	0.8
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.8
27_	Max. force for press fits (static)	N	18
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	10 [5]

	Mechanical data sleeve bearings		
23_	Max. speed	rpm	17000
24_	Axial play	mm	0...0.2
	Preload	N	0
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	60
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	2 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		7
31_	Weight of motor	g	26
32_	Typical noise level	dBA	38

Operating Range

n [rpm] Winding 12 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
331_GPX 16 A/C	1–2 [3–4]	433_ENX 10 EASY	486_ESCON Module 24/2
332_GPX 16 LN/LZ	1–2 [3–4]	433_ENX 10 QUAD	486_ESCON 36/2 DC
333_GPX 16 HP	2–3 [4]	434_ENX 10 EASY XT	487_ESCON Module 50/5
335_GPX 19 A/C	3–4	436_ENX 16 EASY	489_ESCON 50/5
336_GPX 19 LN/LZ	3–4	437_ENX 16 EASY XT	496_EPOS4 Mod./Comp. 50/5
337_GPX 19 HP	4	438_ENX 16 EASY Abs.	498_EPOS4 Mod./Comp. 24/1.5
		439_ENX 16 EASY Abs. XT	501_EPOS4 50/5
		443_ENX 16 RIO	

Configuration

Bearing: Ball bearings preloaded/sleeve bearings
Commutation: Precious metal brushes with CLL/graphite brushes
Flange front/back: Standard flange/configurable flange/no flange
Shaft front/back: Length/diameter/flat face
Electric connection: Terminals or cable/alignment of connection/cable length/connector type

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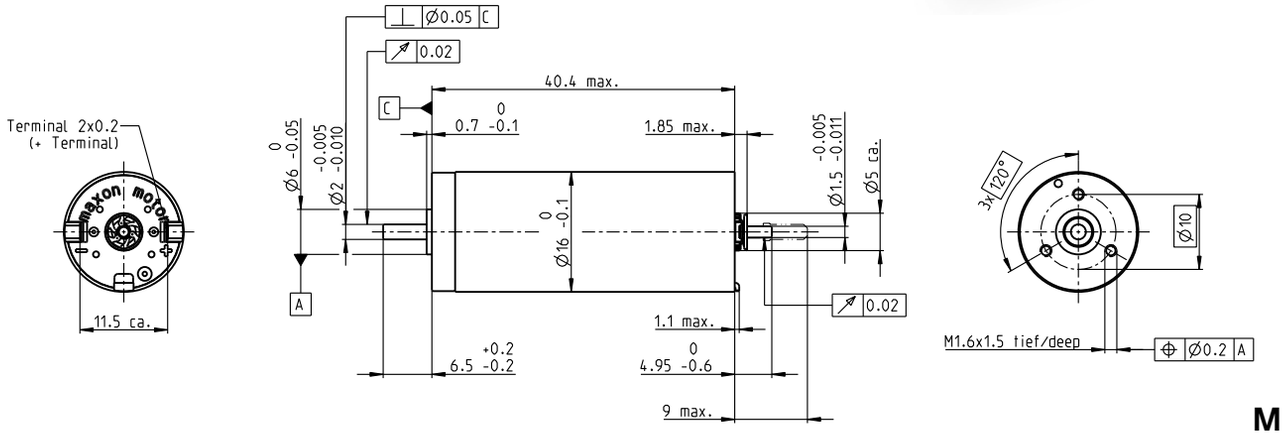
DCX 16 L Precious Metal Brushes
DC motor ∅16 mm

Key Data: 5/10 W, 11.5 mNm, 8680 rpm

DCX

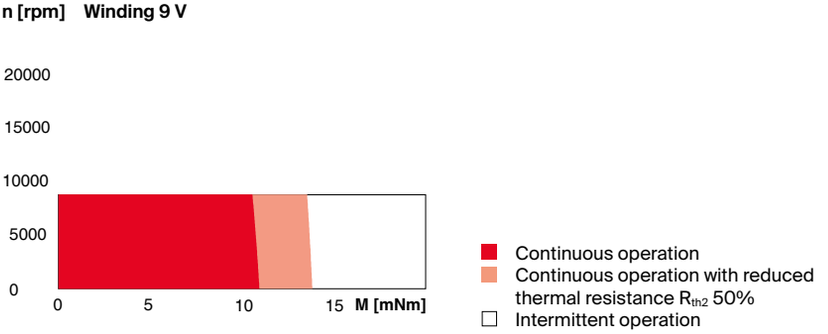


M 1:1

	Motor Data							
1_	Nominal voltage	V	3	6	9	12	18	24
2_	No load speed	rpm	6400	6620	6410	6400	6400	6560
3_	No load current	mA	62.5	32.6	20.8	15.6	10.4	8.05
4_	Nominal speed	rpm	5450	4920	4620	4490	4510	4630
5_	Nominal torque (max. continuous torque)	mNm	5.06	10.0	11.6	10.8	10.9	10.7
6_	Nominal current (max. continuous current)	A	1.20	1.20	0.89	0.625	0.42	0.316
7_	Stall torque	mNm	34.4	39.3	41.8	36.6	37.3	36.6
8_	Stall current	A	7.73	4.57	3.14	2.06	1.40	1.06
9_	Max. efficiency	%	83	84	84	83	84	83
10_	Terminal resistance	Ω	0.388	1.31	2.87	5.82	12.9	22.7
11_	Terminal inductance	mH	0.026	0.096	0.231	0.411	0.925	1.56
12_	Torque constant	mNm/A	4.44	8.59	13.3	17.8	26.7	34.7
13_	Speed constant	rpm/V	2150	1110	716	537	358	276
14_	Speed/torque gradient	rpm/mNm	188	170	154	176	173	181
15_	Mechanical time constant	ms	4.29	4.20	4.18	4.19	4.22	4.23
16_	Rotor inertia	gcm²	2.18	2.36	2.59	2.28	2.33	2.23

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	17.9
18_	Thermal resistance winding-housing	K/W	7.21
19_	Thermal time constant winding	s	21.5
20_	Thermal time constant motor	s	294
21_	Ambient temperature ball bearings	°C	-40...+85
	Ambient temperature sleeve bearings	°C	-30...+85
22_	Max. winding temperature	°C	100
	Mechanical data ball bearings		
23_	Max. speed	rpm	8680
24_	Axial play	mm	0...0.1
	Preload	N	0.8
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.8
27_	Max. force for press fits (static)	N	18
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	10 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	8680
24_	Axial play	mm	0...0.2
	Preload	N	0
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	60
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	2 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		7
31_	Weight of motor	g	42
32_	Typical noise level	dBA	44

Operating Range



maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
331_GPX 16 A/C	1–2 [3–4]	433_ENX 10 EASY	486_ESCON Module 24/2
332_GPX 16 LN/LZ	1–2 [3–4]	433_ENX 10 QUAD	486_ESCON 36/2 DC
333_GPX 16 HP	2–3 [4]	434_ENX 10 EASY XT	496_EPOS4 Mod./Comp. 24/1.5
335_GPX 19 A/C	3–4	436_ENX 16 EASY	504_EPOS2 P 24/5
336_GPX 19 LN/LZ	3–4	437_ENX 16 EASY XT	
337_GPX 19 HP	4	438_ENX 16 EASY Abs.	
		439_ENX 16 EASY Abs. XT	
		443_ENX 16 RIO	

Configuration

Bearing: Ball bearings preloaded/sleeve bearings
Commutation: Precious metal brushes with CLL/graphite brushes
Flange front/back: Standard flange/configurable flange/no flange
Shaft front/back: Length/diameter/flat face
Electric connection: Terminals or cable/alignment of connection/cable length/connector type

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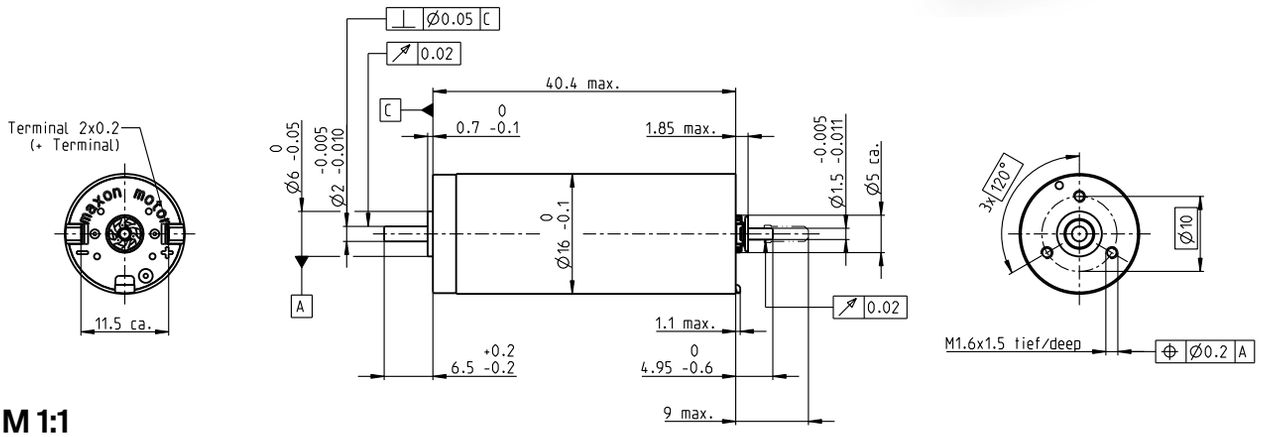
DCX 16 L Graphite Brushes
DC motor ∅16 mm

DCX

Key Data: 10/19 W, 11.7 mNm, 17 000 rpm



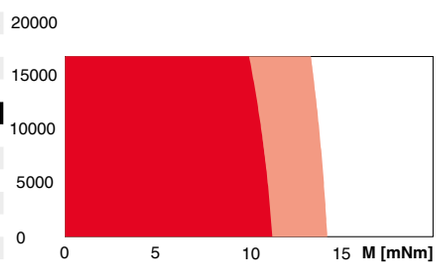
M 1:1

	Motor Data							
1_	Nominal voltage	V	6	9	12	18	24	36
2_	No load speed	rpm	12800	13100	13200	12800	12800	12800
3_	No load current	mA	73.5	50.7	38.6	24.5	18.4	12.3
4_	Nominal speed	rpm	11000	11000	10700	10600	10600	10700
5_	Nominal torque (max. continuous torque)	mNm	8.58	11.8	10.4	11.6	11.3	11.6
6_	Nominal current (max. continuous current)	A	2.00	1.85	1.24	0.896	0.651	0.447
7_	Stall torque	mNm	61.8	74.2	63.3	74.5	68.5	72
8_	Stall current	A	13.9	11.4	7.37	5.59	3.85	2.70
9_	Max. efficiency	%	85	87	83	86	86	87
10_	Terminal resistance	Ω	0.431	0.791	1.63	3.22	6.23	13.3
11_	Terminal inductance	mH	0.026	0.055	0.096	0.231	0.411	0.925
12_	Torque constant	mNm/A	4.44	6.52	8.59	13.3	17.8	26.7
13_	Speed constant	rpm/V	2150	1470	1110	716	537	358
14_	Speed/torque gradient	rpm/mNm	209	178	211	173	188	179
15_	Mechanical time constant	ms	4.77	4.47	5.21	4.70	4.48	4.37
16_	Rotor inertia	gcm²	2.18	2.40	2.36	2.59	2.28	2.33

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	17.9
18_	Thermal resistance winding-housing	K/W	7.21
19_	Thermal time constant winding	s	21.5
20_	Thermal time constant motor	s	294
21_	Ambient temperature ball bearings	°C	-40...+100
	Ambient temperature sleeve bearings	°C	-30...+100
22_	Max. winding temperature	°C	125
	Mechanical data ball bearings		
23_	Max. speed	rpm	17 000
24_	Axial play	mm	0...0.1
	Preload	N	0.8
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.8
27_	Max. force for press fits (static)	N	18
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	10 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	15 000
24_	Axial play	mm	0...0.2
	Preload	N	0
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	60
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	2 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		7
31_	Weight of motor	g	42
32_	Typical noise level	dBA	40

Operating Range

n [rpm] Winding 12 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
331_GPX 16 A/C	1–2 [3–4]	433_ENX 10 EASY	486_ESCON Module 24/2
332_GPX 16 LN/LZ	1–2 [3–4]	433_ENX 10 QUAD	486_ESCON 36/2 DC
333_GPX 16 HP	2–3 [4]	434_ENX 10 EASY XT	496_EPOS4 Mod./Comp. 24/1.5
335_GPX 19 A/C	3–4	436_ENX 16 EASY	496_EPOS4 Mod./Comp. 50/5
336_GPX 19 LN/LZ	3–4	437_ENX 16 EASY XT	501_EPOS4 50/5
337_GPX 19 HP	4	438_ENX 16 EASY Abs.	504_EPOS2 P 24/5
		439_ENX 16 EASY Abs. XT	
		443_ENX 16 RIO	

Configuration

Bearing: Ball bearings preloaded/sleeve bearings
Commutation: Precious metal brushes with CLL/graphite brushes
Flange front/back: Standard flange/configurable flange/no flange
Shaft front/back: Length/diameter/flat face
Electric connection: Terminals or cable/alignment of connection/cable length/connector type

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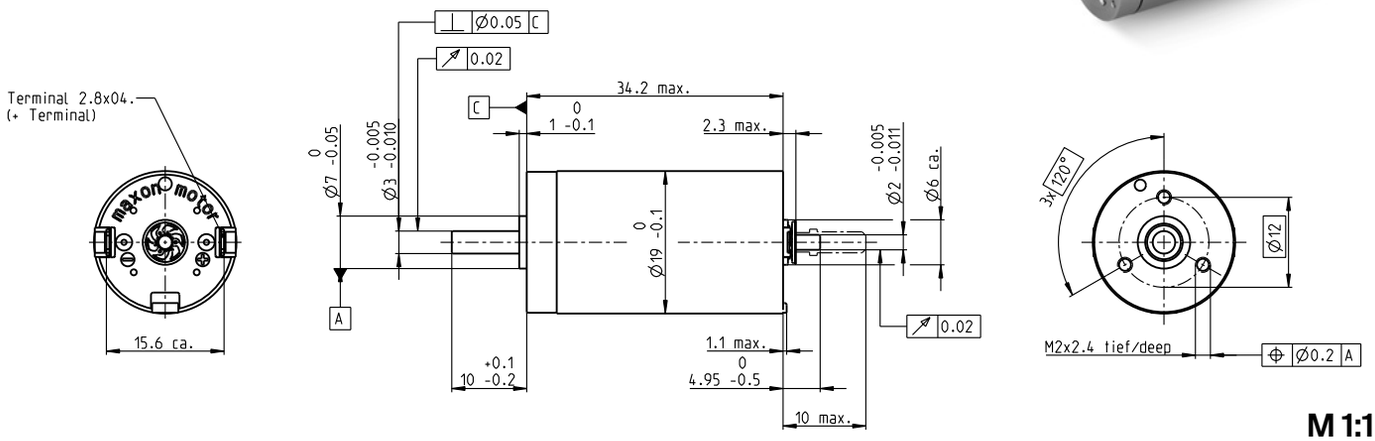
DCX 19 S Precious Metal Brushes
DC motor ∅19 mm

Key Data: 5/8 W, 11.0 mNm, 7500 rpm

DCX



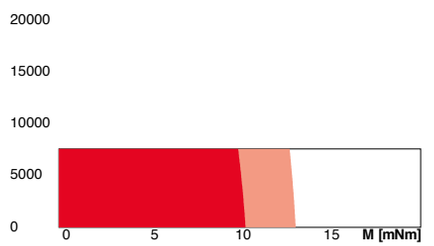
M 1:1

	Motor Data							
1_	Nominal voltage	V	4.5	6	9	12	18	24
2_	No load speed	rpm	6440	6350	6260	6360	6360	6350
3_	No load current	mA	72	53	34.6	26.5	17.7	13.2
4_	Nominal speed	rpm	5080	4540	4350	4490	4490	4480
5_	Nominal torque (max. continuous torque)	mNm	7.46	10.3	10.8	11.0	11.0	10.9
6_	Nominal current (max. continuous current)	A	1.20	1.20	0.829	0.643	0.428	0.319
7_	Stall torque	mNm	35.7	36.3	35.8	38.0	37.8	37.5
8_	Stall current	A	5.42	4.07	2.64	2.13	1.41	1.05
9_	Max. efficiency	%	78	79	79	79	79	79
10_	Terminal resistance	Ω	0.831	1.47	3.40	5.63	12.7	22.8
11_	Terminal inductance	mH	0.045	0.082	0.191	0.329	0.740	1.320
12_	Torque constant	mNm/A	6.58	8.90	13.5	17.8	26.7	35.6
13_	Speed constant	rpm/V	1450	1070	705	536	358	268
14_	Speed/torque gradient	rpm/mNm	183	177	177	170	170	172
15_	Mechanical time constant	ms	5.12	4.99	4.92	4.89	4.89	4.90
16_	Rotor inertia	gcm²	2.67	2.68	2.65	2.75	2.74	2.72

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	17.6
18_	Thermal resistance winding-housing	K/W	6.5
19_	Thermal time constant winding	s	11.6
20_	Thermal time constant motor	s	312
21_	Ambient temperature ball bearings	°C	-40...+85
	Ambient temperature sleeve bearings	°C	-30...+85
22_	Max. winding temperature	°C	100
	Mechanical data ball bearings		
23_	Max. speed	rpm	7500
24_	Axial play	mm	0...0.1
	Preload	N	2.5
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	2.5
27_	Max. force for press fits (static)	N	30
	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	16 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	7500
24_	Axial play	mm	0...0.2
	Preload	N	0
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	80
	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	3 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		9
31_	Weight of motor	g	50
32_	Typical noise level	dBA	48

Operating Range

n [rpm] Winding 9 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
335_GPX 19 A/C	1–2 [3–4]	433_ENX 10 EASY	486_ESCON Module 24/2
336_GPX 19 LN/LZ	1–2 [3–4]	433_ENX 10 QUAD	486_ESCON 36/2 DC
337_GPX 19 HP	2–3 [4]	434_ENX 10 EASY XT	496_EPOS4 Mod./Comp. 24/1.5
339_GPX 22 A/C	3–4	436_ENX 16 EASY	504_EPOS2 P 24/5
340_GPX 22 LN/LZ	3–4	437_ENX 16 EASY XT	
341_GPX 22 HP	4	438_ENX 16 EASY Abs.	
		439_ENX 16 EASY Abs. XT	
		443_ENX 16 RIO	

Configuration

Bearing: Ball bearings preloaded/sleeve bearings
Commutation: Precious metal brushes with CLL/graphite brushes
Flange front/back: Standard flange/configurable flange/no flange
Shaft front/back: Length/diameter/flat face
Electric connection: Terminals or cable/alignment of connection/cable length/connector type

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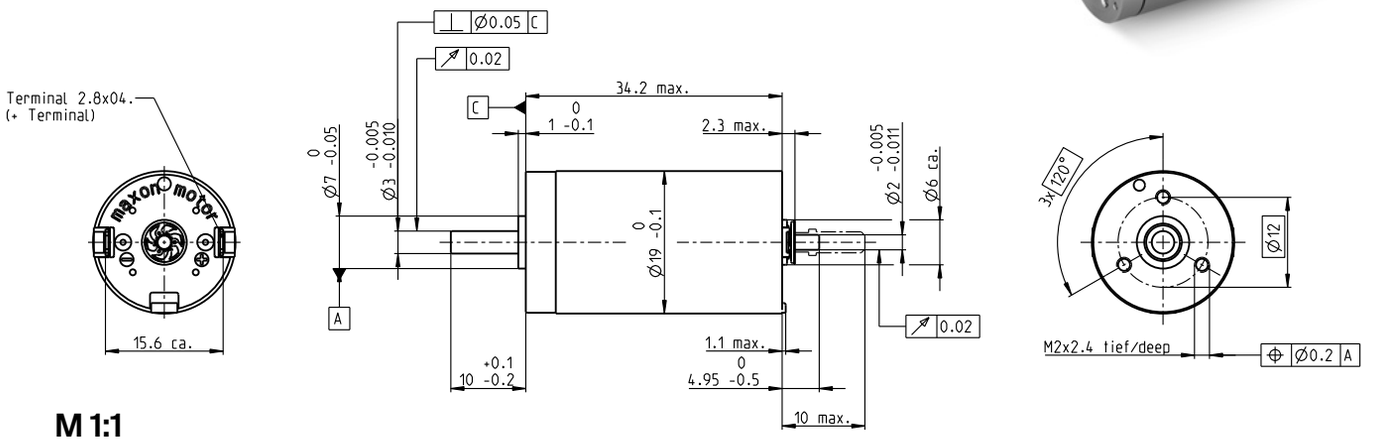
DCX 19 S Graphite Brushes
DC motor ∅19 mm

Key Data: 11/17 W, 11.3 mNm, 16 000 rpm



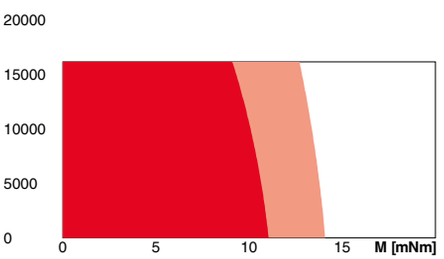
M 1:1

	Motor Data							
1_	Nominal voltage	V	9	12	18	24	36	48
2_	No load speed	rpm	12900	12800	12600	12700	12700	12700
3_	No load current	mA	102	75	48.9	37.4	25	18.7
4_	Nominal speed	rpm	10900	10800	10600	10600	10700	10700
5_	Nominal torque (max. continuous torque)	mNm	11.3	11.4	11.4	11.1	11.3	11.3
6_	Nominal current (max. continuous current)	A	1.81	1.35	0.884	0.657	0.445	0.335
7_	Stall torque	mNm	73.8	73.9	72.2	73.2	73.9	73.8
8_	Stall current	A	11.2	8.30	5.33	4.11	2.77	2.07
9_	Max. efficiency	%	82	82	82	81	82	82
10_	Terminal resistance	Ω	0.802	1.45	3.38	5.84	13.0	23.2
11_	Terminal inductance	mH	0.045	0.082	0.191	0.329	0.740	1.320
12_	Torque constant	mNm/A	6.58	8.90	13.5	17.8	26.7	35.6
13_	Speed constant	rpm/V	1450	1070	705	536	358	268
14_	Speed/torque gradient	rpm/mNm	177	174	176	176	174	174
15_	Mechanical time constant	ms	4.94	4.90	4.88	5.07	5.00	4.97
16_	Rotor inertia	gcm²	2.67	2.68	2.65	2.75	2.74	2.72

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	17.6
18_	Thermal resistance winding-housing	K/W	6.5
19_	Thermal time constant winding	s	11.6
20_	Thermal time constant motor	s	312
21_	Ambient temperature ball bearings	°C	-40...+100
	Ambient temperature sleeve bearings	°C	-30...+100
22_	Max. winding temperature	°C	125
	Mechanical data ball bearings		
23_	Max. speed	rpm	16 000
24_	Axial play	mm	0...0.1
	Preload	N	2.5
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	2.5
27_	Max. force for press fits (static)	N	30
	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	16 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	13 500
24_	Axial play	mm	0...0.2
	Preload	N	0
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	80
	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	3 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		9
31_	Weight of motor	g	50
32_	Typical noise level	dBA	40

Operating Range

n [rpm] Winding 18 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
335_GPX 19 A/C	1–2 [3–4]	433_ENX 10 EASY	486_ESCON Module 24/2
336_GPX 19 LN/LZ	1–2 [3–4]	433_ENX 10 QUAD	486_ESCON 36/2 DC
337_GPX 19 HP	2–3 [4]	434_ENX 10 EASY XT	487_ESCON Module 50/5
339_GPX 22 A/C	3–4	436_ENX 16 EASY	489_ESCON 50/5
340_GPX 22 LN/LZ	3–4	437_ENX 16 EASY XT	496_EPOS4 Mod./Comp. 24/1.5
341_GPX 22 HP	4	438_ENX 16 EASY Abs.	496_EPOS4 Mod./Comp. 50/5
		439_ENX 16 EASY Abs. XT	501_EPOS4 50/5
		443_ENX 16 RIO	504_EPOS2 P 24/5

Configuration

Bearing: Ball bearings preloaded/sleeve bearings
Commutation: Precious metal brushes with CLL/graphite brushes
Flange front/back: Standard flange/configurable flange/no flange
Shaft front/back: Length/diameter/flat face
Electric connection: Terminals or cable/alignment of connection/cable length/connector type

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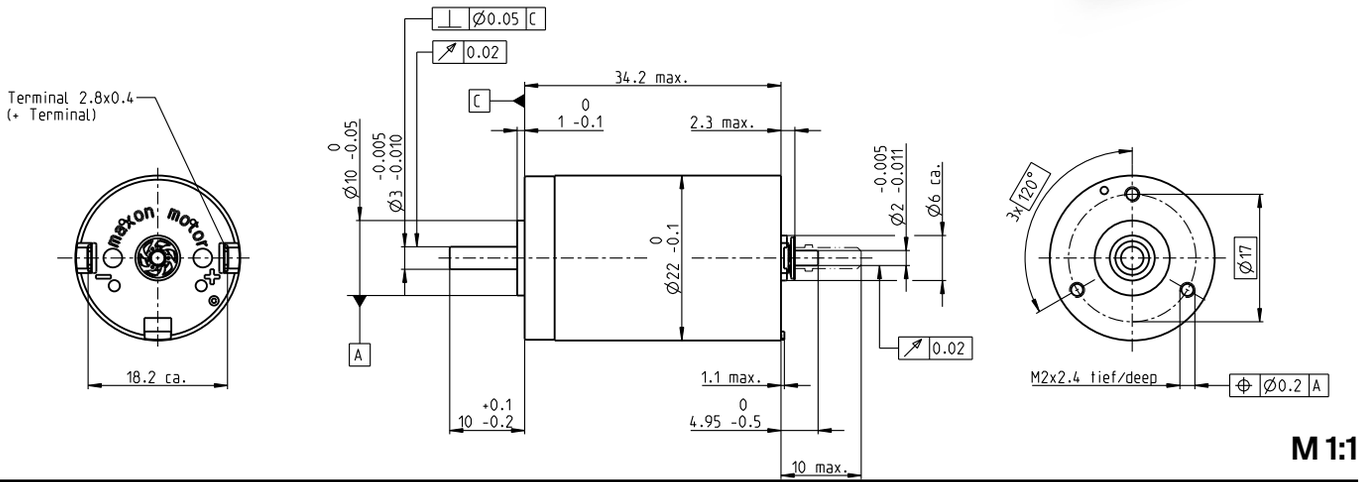
DCX 22 S Precious Metal Brushes
DC motor ∅22 mm

DCX

Key Data: 6/10 W, 14.5 mNm, 7160 rpm



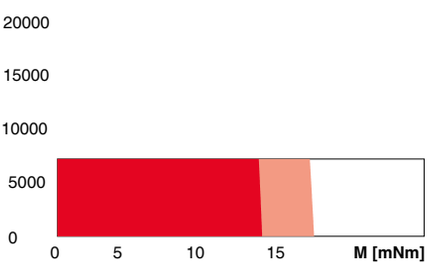
M 1:1

	Motor Data							
1_	Nominal voltage	V	6	12	18	24	36	48
2_	No load speed	rpm	6200	6200	6110	6340	6550	5890
3_	No load current	mA	39.2	19.6	12.8	10.1	7.09	4.55
4_	Nominal speed	rpm	4960	4670	4560	4700	4940	4240
5_	Nominal torque (max. continuous torque)	mNm	10.7	14.7	14.5	13.6	13.8	13.6
6_	Nominal current (max. continuous current)	A	1.20	0.817	0.531	0.388	0.272	0.180
7_	Stall torque	mNm	53.7	59.7	57.5	52.7	56.5	48.6
8_	Stall current	A	5.85	3.25	2.06	1.47	1.08	0.63
9_	Max. efficiency	%	84	85	85	84	85	84
10_	Terminal resistance	Ω	1.02	3.69	8.75	16.3	33.3	76.2
11_	Terminal inductance	mH	0.058	0.231	0.535	0.881	1.86	4.08
12_	Torque constant	mNm/A	9.18	18.4	28.0	35.9	52.2	77.2
13_	Speed constant	rpm/V	1040	520	342	266	183	124
14_	Speed/torque gradient	rpm/mNm	116	104	107	121	117	122
15_	Mechanical time constant	ms	6.14	6.07	6.09	5.93	6.15	6.19
16_	Rotor inertia	gcm²	5.05	5.55	5.44	4.67	5.03	4.84

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	16
18_	Thermal resistance winding-housing	K/W	7
19_	Thermal time constant winding	s	20
20_	Thermal time constant motor	s	528
21_	Ambient temperature ball bearings	°C	-40...85
	Ambient temperature sleeve bearings	°C	-30...85
22_	Max. winding temperature	°C	100
	Mechanical data ball bearings		
23_	Max. speed	rpm	7160
24_	Axial play	mm	0...0.1
	Preload	N	2.5
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	2.5
27_	Max. force for press fits (static)	N	30
	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	16 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	7160
24_	Axial play	mm	0...0.2
	Preload	N	0
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	80
	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	3 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		9
31_	Weight of motor	g	66
32_	Typical noise level	dBA	48

Operating Range

n [rpm] Winding 18 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
339_GPX 22 A/C	1–2 [3–4]	433_ENX 10 EASY	486_ESCON Module 24/2
340_GPX 22 LN/LZ	1–2 [3–4]	433_ENX 10 QUAD	486_ESCON 36/2 DC
341_GPX 22 HP	2–3 [4]	434_ENX 10 EASY XT	487_ESCON Module 50/5
342_GPX 22 UP	1–4	436_ENX 16 EASY	489_ESCON 50/5
344_GPX 26 A/C	3	437_ENX 16 EASY XT	496_EPOS4 Mod./Comp. 24/1.5
345_GPX 26 LN/LZ	3	438_ENX 16 EASY Abs.	496_EPOS4 Mod./Comp. 50/5
346_GPX 26 HP	4	439_ENX 16 EASY Abs. XT	501_EPOS4 50/5
		443_ENX 16 RIO	504_EPOS2 P 24/5
		470_ENC AEDL 5810	
		471_ENC 30 HEDS 5540	
		477_ENC 30 HEDL 5540	

Configuration

Bearing: Ball bearings preloaded/sleeve bearings
Commutation: Precious metal brushes with or without CLL/graphite brushes/EMI filter
Flange front/back: Standard flange/configurable flange/no flange
Shaft front/back: Length/diameter/flat face
Electric connection: Terminals or cable/alignment of connection/cable length/connector type

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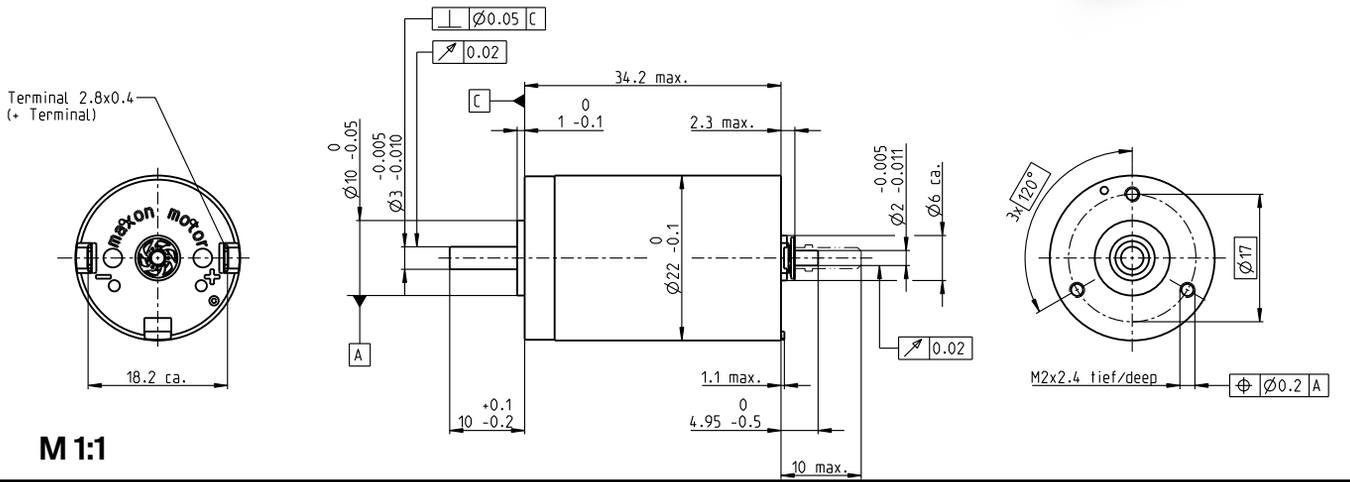
DCX 22 S Graphite Brushes
DC motor ∅22 mm

DCX

Key Data: 14/24 W, 15.3 mNm, 18 000 rpm



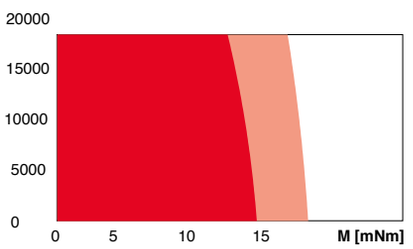
M 1:1

	Motor Data							
1_	Nominal voltage	V	6	12	18	24	36	48
2_	No load speed	rpm	11400	12400	12400	12400	12200	12700
3_	No load current	mA	126	71.7	47.8	35.9	23.4	18.5
4_	Nominal speed	rpm	9700	10700	10800	10800	10500	10900
5_	Nominal torque (max. continuous torque)	mNm	14.4	14.6	14.9	15.3	14.8	14.0
6_	Nominal current (max. continuous current)	A	3.00	1.65	1.12	0.869	0.552	0.406
7_	Stall torque	mNm	101	108	112	120	113	104
8_	Stall current	A	20.2	11.8	8.15	6.51	4.03	2.90
9_	Max. efficiency	%	85	85	85	86	85	84
10_	Terminal resistance	Ω	0.297	1.02	2.21	3.69	8.94	16.6
11_	Terminal inductance	mH	0.017	0.058	0.130	0.231	0.535	0.881
12_	Torque constant	mNm/A	5.01	9.18	13.8	18.4	28.0	35.9
13_	Speed constant	rpm/V	1910	1040	693	520	342	266
14_	Speed/torque gradient	rpm/mNm	113	116	111	104	109	123
15_	Mechanical time constant	ms	6.23	6.12	6.08	6.07	6.22	6.01
16_	Rotor inertia	gcm²	5.27	5.05	5.22	5.55	5.44	4.67

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	16
18_	Thermal resistance winding-housing	K/W	7
19_	Thermal time constant winding	s	20
20_	Thermal time constant motor	s	528
21_	Ambient temperature ball bearings	°C	-40...+100
	Ambient temperature sleeve bearings	°C	-30...+100
22_	Max. winding temperature	°C	125
	Mechanical data ball bearings		
23_	Max. speed	rpm	18 000
24_	Axial play	mm	0...0.1
	Preload	N	2.5
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	2.5
27_	Max. force for press fits (static)	N	30
	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	16 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	18 000
24_	Axial play	mm	0...0.2
	Preload	N	0
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	80
	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	3 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		9
31_	Weight of motor	g	66
32_	Typical noise level	dBA	41

Operating Range

n [rpm] Winding 18 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
339_GPX 22 A/C	1–2 [3–4]	433_ENX 10 EASY	486_ESCON Module 24/2
340_GPX 22 LN/LZ	1–2 [3–4]	433_ENX 10 QUAD	486_ESCON 36/2 DC
341_GPX 22 HP	2–3 [4]	434_ENX 10 EASY XT	487_ESCON Module 50/5
342_GPX 22 UP	1–4	436_ENX 16 EASY	489_ESCON 50/5
344_GPX 26 A/C	3	437_ENX 16 EASY XT	496_EPOS4 Mod./Comp. 24/1.5
345_GPX 26 LN/LZ	3	438_ENX 16 EASY Abs.	496_EPOS4 Mod./Comp. 50/5
346_GPX 26 HP	4	439_ENX 16 EASY Abs. XT	501_EPOS4 50/5
		443_ENX 16 RIO	504_EPOS2 P 24/5
		470_ENC AEDL 5810	
		471_ENC 30 HEDS 5540	
		477_ENC 30 HEDL 5540	

Configuration

Bearing: Ball bearings preloaded/sleeve bearings
Commutation: Precious metal brushes with or without CLL/graphite brushes/EMI filter
Flange front/back: Standard flange/configurable flange/no flange
Shaft front/back: Length/diameter/flat face
Electric connection: Terminals or cable/alignment of connection/cable length/connector type

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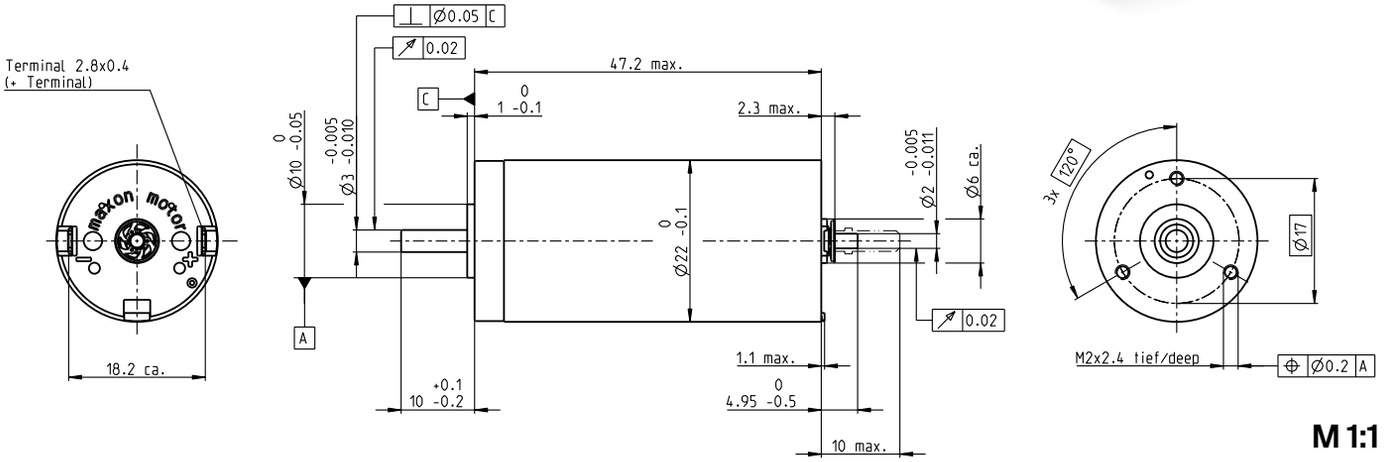
DCX 22 L Precious Metal Brushes
DC motor ∅22 mm

DCX

Key Data: 11/20 W, 29.8 mNm, 7160 rpm

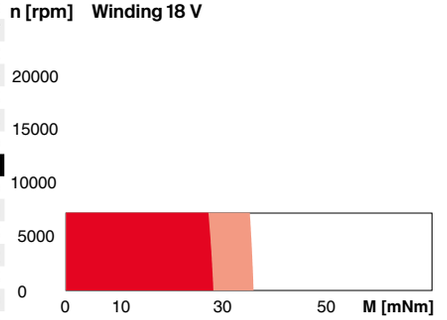


M 1:1

	Motor Data								
1_	Nominal voltage	V	6	9	12	18	24	36	48
2_	No load speed	rpm	5870	5870	4980	5740	5060	6020	5220
3_	No load current	mA	51.0	34	20.0	16.4	10.2	8.82	5.36
4_	Nominal speed	rpm	5380	5210	4000	4780	4070	5040	4180
5_	Nominal torque (max. continuous torque)	mNm	14.1	21.4	29.5	29.8	29.2	29.2	27.8
6_	Nominal current (max. continuous current)	A	1.50	1.50	1.30	1.01	0.655	0.520	0.322
7_	Stall torque	mNm	170	191	150	178	150	180	140
8_	Stall current	A	17.5	13.1	6.54	5.97	3.31	3.16	1.60
9_	Max. efficiency	%	89	90	89	90	89	90	89
10_	Terminal resistance	Ω	0.343	0.687	1.84	3.01	7.25	11.4	29.9
11_	Terminal inductance	mH	0.035	0.078	0.192	0.326	0.746	1.19	2.80
12_	Torque constant	mNm/A	9.73	14.6	22.9	29.9	45.2	57.0	87.6
13_	Speed constant	rpm/V	981	654	416	320	211	168	109
14_	Speed/torque gradient	rpm/mNm	34.6	30.8	33.3	32.2	33.9	33.5	37.3
15_	Mechanical time constant	ms	3.28	3.17	3.14	3.13	3.14	3.14	3.17
16_	Rotor inertia	gcm²	9.06	9.82	9.00	9.26	8.85	8.94	8.12

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	13.6
18_	Thermal resistance winding-housing	K/W	4.57
19_	Thermal time constant winding	s	22
20_	Thermal time constant motor	s	646
21_	Ambient temperature ball bearings	°C	-40...+85
	Ambient temperature sleeve bearings	°C	-30...+85
22_	Max. winding temperature	°C	100
	Mechanical data ball bearings		
23_	Max. speed	rpm	7160
24_	Axial play	mm	0...0.1
	Preload	N	2.5
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	2.5
27_	Max. force for press fits (static)	N	30
	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	16 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	7160
24_	Axial play	mm	0...0.2
	Preload	N	0
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	80
	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	3 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		9
31_	Weight of motor	g	95
32_	Typical noise level	dBA	52

Operating Range



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
339_GPX 22 A/C	1–2 [3–4]	433_ENX 10 EASY	486_ESCON Module 24/2
340_GPX 22 LN/LZ	1–2 [3–4]	433_ENX 10 QUAD	486_ESCON 36/2 DC
341_GPX 22 HP	2–3 [4]	434_ENX 10 EASY XT	487_ESCON Module 50/5
342_GPX 22 UP	1–4	436_ENX 16 EASY	489_ESCON 50/5
344_GPX 26 A/C	3	437_ENX 16 EASY XT	496_EPOS4 Mod./Comp. 24/1.5
345_GPX 26 LN/LZ	3	438_ENX 16 EASY Abs.	496_EPOS4 Mod./Comp. 50/5
346_GPX 26 HP	4	439_ENX 16 EASY Abs. XT	501_EPOS4 50/5
		443_ENX 16 RIO	504_EPOS2 P 24/5
		470_ENC AEDL 5810	
		471_ENC 30 HEDS 5540	
		477_ENC 30 HEDL 5540	

Configuration

Bearing: Ball bearings preloaded/sleeve bearings
Commutation: Precious metal brushes with or without CLL/graphite brushes/EMI filter
Flange front/back: Standard flange/configurable flange/no flange
Shaft front/back: Length/diameter/flat face
Electric connection: Terminals or cable/alignment of connection/cable length/connector type

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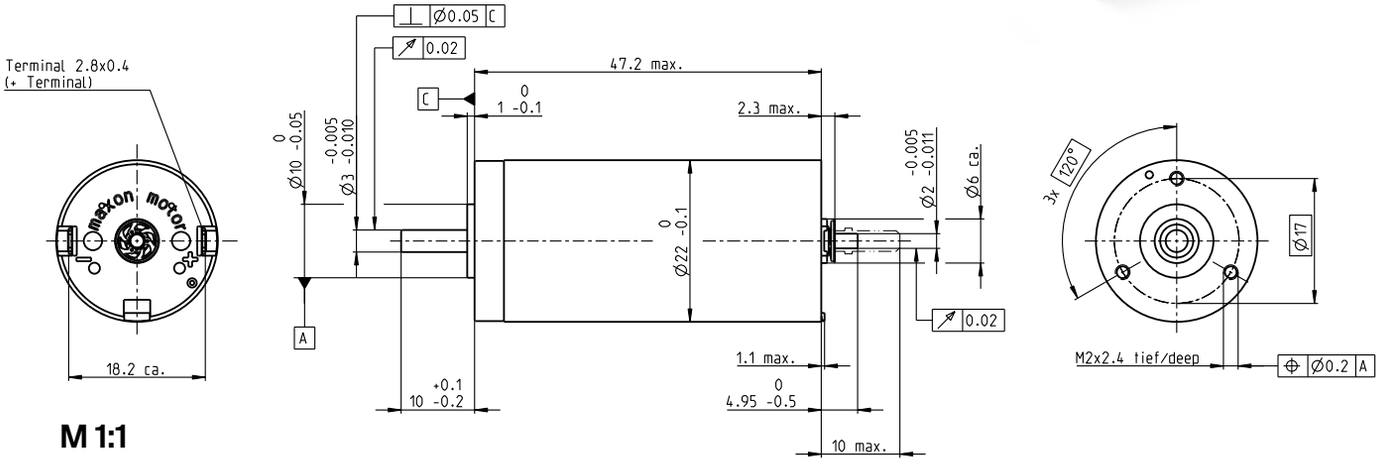
DCX 22 L Graphite Brushes
DC motor ∅22 mm

DCX

Key Data: 20/49 W, 32.2 mNm, 18 000 rpm



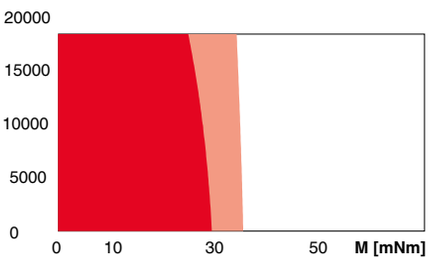
M 1:1

	Motor Data						
1_	Nominal voltage	V	9	12	18	36	48
2_	No load speed	rpm	12300	11700	11800	11400	10100
3_	No load current	mA	118	81.8	54.6	26.3	16.2
4_	Nominal speed	rpm	11400	10700	10800	10400	9020
5_	Nominal torque (max. continuous torque)	mNm	27.0	30.5	32.2	30.0	30.3
6_	Nominal current (max. continuous current)	A	4.00	3.21	2.26	1.03	0.687
7_	Stall torque	mNm	371	348	386	346	294
8_	Stall current	A	53.4	35.8	26.5	11.6	6.50
9_	Max. efficiency	%	90	91	91	90	90
10_	Terminal resistance	Ω	0.168	0.335	0.680	3.11	7.39
11_	Terminal inductance	mH	0.018	0.035	0.078	0.326	0.746
12_	Torque constant	mNm/A	6.95	9.73	14.6	29.9	45.2
13_	Speed constant	rpm/V	1370	981	654	320	211
14_	Speed/torque gradient	rpm/mNm	33.3	33.8	30.5	33.3	34.6
15_	Mechanical time constant	ms	3.27	3.21	3.13	3.23	3.20
16_	Rotor inertia	gcm²	9.37	9.06	9.82	9.26	8.85

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	13.6
18_	Thermal resistance winding-housing	K/W	4.57
19_	Thermal time constant winding	s	22
20_	Thermal time constant motor	s	646
21_	Ambient temperature ball bearings	°C	-40...+100
	Ambient temperature sleeve bearings	°C	-30...+100
22_	Max. winding temperature	°C	125
	Mechanical data ball bearings		
23_	Max. speed	rpm	18 000
24_	Axial play	mm	0...0.1
	Preload	N	2.5
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	2.5
27_	Max. force for press fits (static)	N	30
	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	16 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	18 000
24_	Axial play	mm	0...0.2
	Preload	N	0
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	80
	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	3 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		9
31_	Weight of motor	g	95
32_	Typical noise level	dBA	44

Operating Range

n [rpm] Winding 18 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
339_GPX 22 A/C	1–2 [3–4]	433_ENX 10 EASY	486_ESCON Module 24/2
340_GPX 22 LN/LZ	1–2 [3–4]	433_ENX 10 QUAD	486_ESCON 36/2 DC
341_GPX 22 HP	2–3 [4]	434_ENX 10 EASY XT	487_ESCON Module 50/5
342_GPX 22 UP	1–4	436_ENX 16 EASY	489_ESCON 50/5
344_GPX 26 A/C	3	437_ENX 16 EASY XT	496_EPOS4 Mod./Comp. 24/1.5
345_GPX 26 LN/LZ	3	438_ENX 16 EASY Abs.	496_EPOS4 Mod./Comp. 50/5
346_GPX 26 HP	4	439_ENX 16 EASY Abs. XT	501_EPOS4 50/5
		443_ENX 16 RIO	504_EPOS2 P 24/5
		470_ENC AEDL 5810	
		471_ENC 30 HEDS 5540	
		477_ENC 30 HEDL 5540	

Configuration

Bearing: Ball bearings preloaded/sleeve bearings
Commutation: Precious metal brushes with or without CLL/graphite brushes/EMI filter
Flange front/back: Standard flange/configurable flange/no flange
Shaft front/back: Length/diameter/flat face
Electric connection: Terminals or cable/alignment of connection/cable length/connector type

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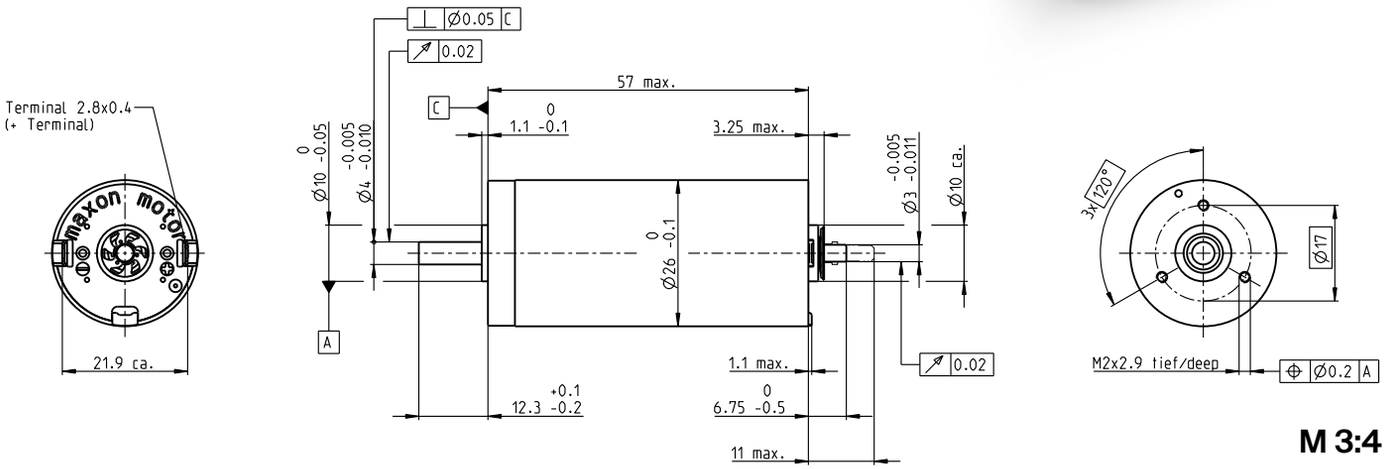
DCX 26 L Precious Metal Brushes
DC motor ∅26 mm

DCX

Key Data: 18/29 W, 52.3 mNm, 5900 rpm



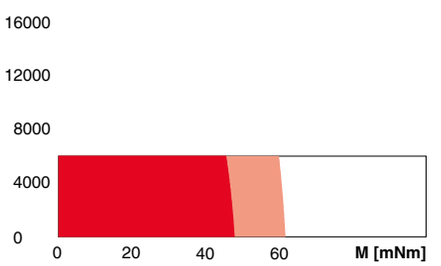
M 3:4

	Motor Data							
1_	Nominal voltage	V	9	12	18	24	36	48
2_	No load speed	rpm	5530	5330	5530	5330	5430	5320
3_	No load current	mA	80.5	56.8	40.2	28.4	19.5	14.2
4_	Nominal speed	rpm	5060	4690	4770	4600	4680	4570
5_	Nominal torque (max. continuous torque)	mNm	32.9	46.1	49.8	52.3	50.8	50.3
6_	Nominal current (max. continuous current)	A	2.2	2.2	1.64	1.25	0.822	0.599
7_	Stall torque	mNm	384	384	362	384	370	355
8_	Stall current	A	24.8	17.9	11.7	8.95	5.86	4.14
9_	Max. efficiency	%	89	89	89	89	89	89
10_	Terminal resistance	Ω	0.363	0.671	1.54	2.68	6.15	11.6
11_	Terminal inductance	mH	0.067	0.129	0.268	0.514	1.11	2.06
12_	Torque constant	mNm/A	15.5	21.4	31	42.9	63.2	85.8
13_	Speed constant	rpm/V	616	445	308	223	151	111
14_	Speed/torque gradient	rpm/mNm	14.4	13.9	15.3	13.9	14.7	15
15_	Mechanical time constant	ms	3.23	3.13	3.11	3.09	3.1	3.11
16_	Rotor inertia	gcm²	21.3	21.4	19.4	21.2	20.1	19.7

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	10.2
18_	Thermal resistance winding-housing	K/W	3.01
19_	Thermal time constant winding	s	24
20_	Thermal time constant motor	s	620
21_	Ambient temperature ball bearings	°C	-40...+85
	Ambient temperature sleeve bearings	°C	-30...+85
22_	Max. winding temperature	°C	100
	Mechanical data ball bearings		
23_	Max. speed	rpm	5900
24_	Axial play	mm	0...0.1
	Preload	N	5.5
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	5.5
27_	Max. force for press fits (static)	N	40
	(static, shaft supported)	N	500
28_	Max. radial load [mm from flange]	N	20.5 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	5900
24_	Axial play	mm	0...0.2
	Preload	N	0
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	80
	(static, shaft supported)	N	500
28_	Max. radial load [mm from flange]	N	5.5 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		11
31_	Weight of motor	g	170
32_	Typical noise level	dBA	48

Operating Range

n [rpm] Winding 18 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
344_GPX 26 A/C	1–2 [3]	433_ENX 10 EASY	486_ESCON 36/2 DC
345_GPX 26 LN/LZ	1–2 [3]	433_ENX 10 QUAD	487_ESCON Module 50/5
346_GPX 26 HP	2–3 [4]	434_ENX 10 EASY XT	489_ESCON 50/5
347_GPX 32 A/C	3	436_ENX 16 EASY	496_EPOS4 Mod./Comp. 24/1.5
348_GPX 32 LN/LZ	3	437_ENX 16 EASY XT	496_EPOS4 Mod./Comp. 50/5
349_GPX 32 HP	4	438_ENX 16 EASY Abs.	501_EPOS4 50/5
		439_ENX 16 EASY Abs. XT	504_EPOS2 P 24/5
		443_ENX 16 RIO	
		470_ENC AEDL 5810	
		471_ENC 30 HEDS 5540	
		477_ENC 30 HEDL 5540	

Configuration

Bearing: Ball bearings preloaded/sleeve bearings
Commutation: Precious metal brushes with CLL/graphite brushes
Flange front/back: Standard flange/configurable flange/no flange
Shaft front/back: Length/diameter/flat face
Electric connection: Terminals or cable/alignment of connection/cable length/connector type

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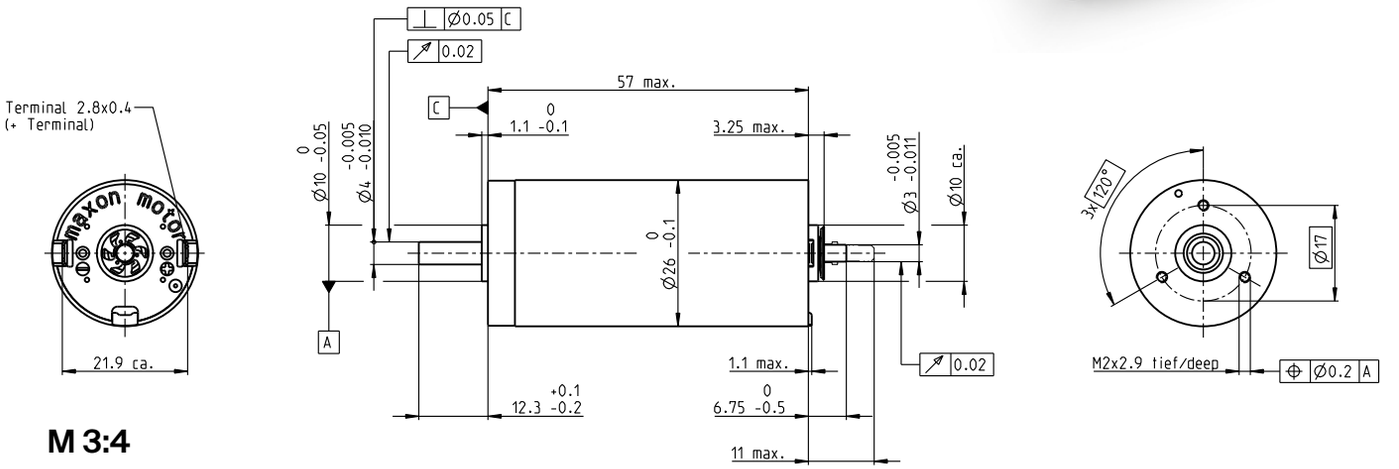
DCX 26 L Graphite Brushes
DC motor ∅26 mm

DCX

Key Data: 40/74 W, 59.8 mNm, 14400 rpm



M 3:4

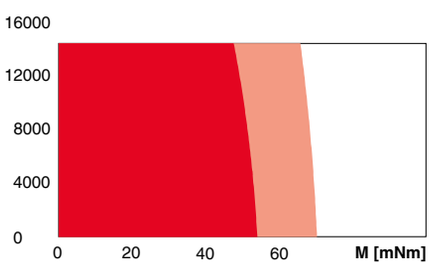
	Motor Data							
1_	Nominal voltage	V	12	18	24	36	48	60
2_	No load speed	rpm	10600	11100	10700	11100	10700	10900
3_	No load current	mA	131	93	65.7	46.5	32.9	27.3
4_	Nominal speed	rpm	9460	10000	9690	10000	9730	10000
5_	Nominal torque (max. continuous torque)	mNm	46.9	54.3	57.8	54	59.1	59.8
6_	Nominal current (max. continuous current)	A	4.5	3.59	2.76	1.79	1.41	1.17
7_	Stall torque	mNm	532	653	695	639	697	750
8_	Stall current	A	49.7	42.2	32.4	20.6	16.2	14.3
9_	Max. efficiency	%	88	90	91	90	91	91
10_	Terminal resistance	Ω	0.242	0.427	0.74	1.75	2.95	4.19
11_	Terminal inductance	mH	0.032	0.067	0.129	0.268	0.514	0.768
12_	Torque constant	mNm/A	10.7	15.5	21.4	31	42.9	52.4
13_	Speed constant	rpm/V	890	616	445	308	223	182
14_	Speed/torque gradient	rpm/mNm	20.1	17	15.4	17.4	15.3	14.6
15_	Mechanical time constant	ms	4.5	3.79	3.45	3.53	3.4	3.16
16_	Rotor inertia	gcm²	21.4	21.3	21.4	19.4	21.2	20.7

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	10.2
18_	Thermal resistance winding-housing	K/W	3.01
19_	Thermal time constant winding	s	24
20_	Thermal time constant motor	s	620
21_	Ambient temperature ball bearings	°C	-40...+100
	Ambient temperature sleeve bearings	°C	-30...+100
22_	Max. winding temperature	°C	155
	Mechanical data ball bearings		
23_	Max. speed	rpm	14400
24_	Axial play	mm	0...0.1
	Preload	N	5.5
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	5.5
27_	Max. force for press fits (static)	N	40
	(static, shaft supported)	N	500
28_	Max. radial load [mm from flange]	N	20.5 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	8600
24_	Axial play	mm	0...0.2
	Preload	N	0
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	80
	(static, shaft supported)	N	500
28_	Max. radial load [mm from flange]	N	5.5 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		11
31_	Weight of motor	g	170
32_	Typical noise level	dBA	44

Motor specifications may vary for version with sintered bearing (max. winding temperature 125°C).

Operating Range

n [rpm] Winding 18 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]
344_GPX 26 A/C	1–2 [3]
345_GPX 26 LN/LZ	1–2 [3]
346_GPX 26 HP	2–3 [4]
347_GPX 32 A/C	3
348_GPX 32 LN/LZ	3
349_GPX 32 HP	4

maxon sensor
433_ENX 10 EASY
433_ENX 10 QUAD
434_ENX 10 EASY XT
436_ENX 16 EASY
437_ENX 16 EASY XT
438_ENX 16 EASY Abs.
439_ENX 16 EASY Abs. XT
443_ENX 16 RIO
470_ENC AEDL 5810
471_ENC 30 HEDS 5540
477_ENC 30 HEDL 5540

maxon motor control
486_ESCON 36/2 DC
487_ESCON Module 50/5
489_ESCON 50/5
496_EPOS4 Mod./Comp. 50/5
501_EPOS4 50/5
504_EPOS2 P 24/5

Configuration

Bearing: Ball bearings preloaded/sleeve bearings
Commutation: Precious metal brushes with CLL/graphite brushes
Flange front/back: Standard flange/configurable flange/no flange
Shaft front/back: Length/diameter/flat face
Electric connection: Terminals or cable/alignment of connection/cable length/connector type

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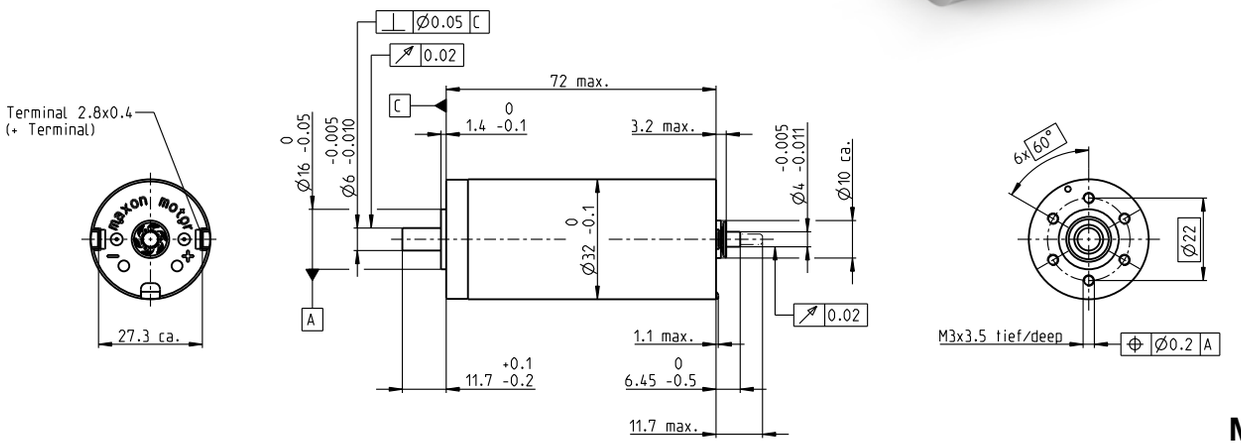
DCX 32 L Graphite Brushes
DC motor ∅32 mm

Key Data: 70/110 W, 128 mNm, 11300 rpm



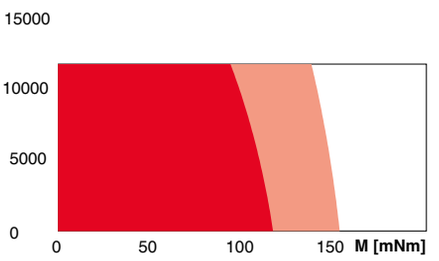
M 1:2

	Motor Data							
1_	Nominal voltage	V	12	18	24	36	48	60
2_	No load speed	rpm	7120	8630	8270	7940	7780	5840
3_	No load current	mA	274	234	164	103	75.2	41.6
4_	Nominal speed	rpm	6560	8070	7710	7410	7260	5290
5_	Nominal torque (max. continuous torque)	mNm	89.4	101	108	119	123	128
6_	Nominal current (max. continuous current)	A	6.00	5.42	4.12	2.87	2.17	1.35
7_	Stall torque	mNm	1730	2120	1980	2020	2000	1420
8_	Stall current	A	111	109	72.5	47.1	34.2	14.5
9_	Max. efficiency	%	85	88	88	90	90	89
10_	Terminal resistance	Ω	0.108	0.165	0.331	0.764	1.40	4.12
11_	Terminal inductance	mH	0.034	0.053	0.103	0.254	0.473	1.31
12_	Torque constant	mNm/A	15.6	19.5	27.3	42.9	58.5	97.5
13_	Speed constant	rpm/V	612	490	350	223	163	97.9
14_	Speed/torque gradient	rpm/mNm	4.24	4.15	4.24	3.96	3.92	4.14
15_	Mechanical time constant	ms	3.44	3.30	3.24	3.19	3.11	3.11
16_	Rotor inertia	gcm²	77.6	75.9	72.8	76.8	75.9	71.7

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	7.28
18_	Thermal resistance winding-housing	K/W	2.3
19_	Thermal time constant winding	s	42.2
20_	Thermal time constant motor	s	837
21_	Ambient temperature	°C	-40...+100
22_	Max. winding temperature	°C	155
	Mechanical data ball bearings		
23_	Max. speed	rpm	11300
24_	Axial play	mm	0...0.1
	Preload	N	7
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	7
27_	Max. force for press fits (static)	N	22.6
	(static, shaft supported)	N	2510
28_	Max. radial load [mm from flange]	N	65.3 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		11
31_	Weight of motor	g	325
32_	Typical noise level	dBA	47

Operating Range

n [rpm] Winding 36 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
347_GPX 32 A/C	1–2 [3]	433_ENX 10 EASY/QUAD	487_ESCON Module 50/5
348_GPX 32 LN/LZ	1–2 [3]	434_ENX 10 EASY XT	488_ESCON Module 50/8 HE
349_GPX 32 HP	2–3 [4]	436_ENX 16 EASY	489_ESCON 50/5
350_GPX 32 UP	1–4	437_ENX 16 EASY XT	489_ESCON 70/10
351_GPX 37 A	3	438_ENX 16 EASY Abs.	496_EPOS4 Mod./Comp. 50/5
352_GPX 37 LN/LZ	3	439_ENX 16 EASY Abs. XT	497_EPOS4 Mod./Comp. 50/8
		443_ENX 16 RIO	501_EPOS4 50/5
		470_ENC AEDL 5810	501_EPOS4 70/15
		471_ENC 30 HEDS 5540	504_EPOS2 P 24/5
		477_ENC 30 HEDL 5540	

Configuration

Bearing: Ball bearings preloaded
Commutation: Graphite brushes
Flange front/back: Standard flange/configurable flange/no flange
Shaft front/back: Length/diameter/flat face
Electric connection: Terminals or cable/alignment of connection/cable length/connector type

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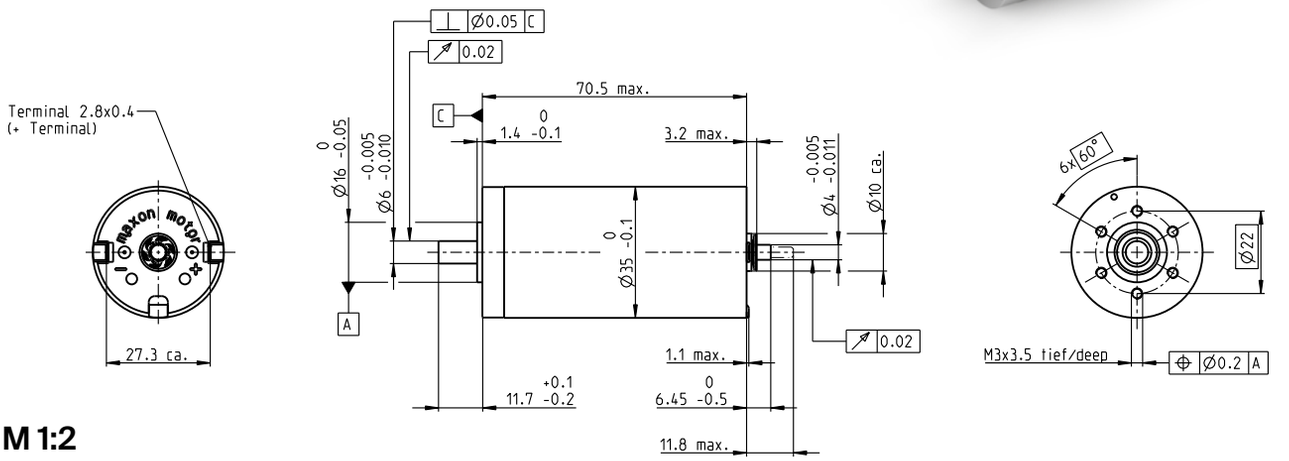
DCX 35 L Graphite Brushes
DC motor ∅35 mm

DCX

Key Data: 80/120 W, 138 mNm, 12300 rpm

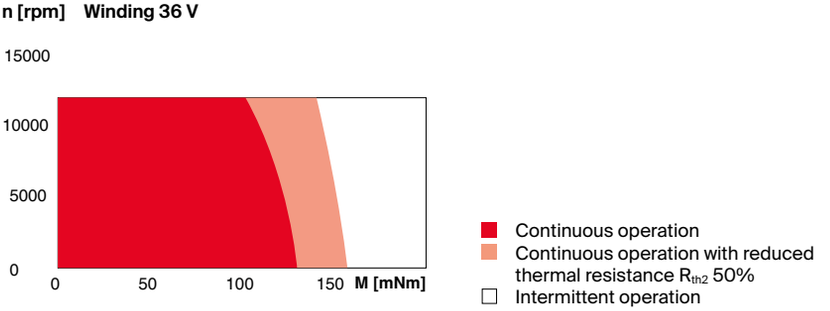


M 1:2

	Motor Data							
1_	Nominal voltage	V	12	18	24	36	48	60
2_	No load speed	rpm	8130	7200	7720	7940	6670	7690
3_	No load current	mA	320	177	146	101	58.6	57.5
4_	Nominal speed	rpm	7610	6640	7160	7410	6140	7160
5_	Nominal torque (max. continuous torque)	mNm	77.7	120	121	128	138	132
6_	Nominal current (max. continuous current)	A	6.00	5.32	4.26	3.07	2.08	1.84
7_	Stall torque	mNm	2080	1980	2030	2160	1860	2050
8_	Stall current	A	152	84.8	69.3	50.3	27.3	27.7
9_	Max. efficiency	%	85	88	89	90	90	90
10_	Terminal resistance	Ω	0.079	0.212	0.346	0.716	1.76	2.16
11_	Terminal inductance	mH	0.026	0.077	0.121	0.260	0.658	0.776
12_	Torque constant	mNm/A	13.7	23.4	29.3	42.9	68.3	74.1
13_	Speed constant	rpm/V	699	408	326	223	140	129
14_	Speed/torque gradient	rpm/mNm	4.04	3.70	3.86	3.72	3.61	3.76
15_	Mechanical time constant	ms	4.21	3.97	3.91	3.84	3.76	3.75
16_	Rotor inertia	gcm²	99.5	102	96.6	98.7	99.5	95.2

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	6.98
18_	Thermal resistance winding-housing	K/W	2.1
19_	Thermal time constant winding	s	43.9
20_	Thermal time constant motor	s	1030
21_	Ambient temperature	°C	-40...+100
22_	Max. winding temperature	°C	155
	Mechanical data ball bearings		
23_	Max. speed	rpm	12300
24_	Axial play	mm	0...0.1
	Preload	N	7
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	7
27_	Max. force for press fits (static)	N	22.6
	(static, shaft supported)	N	2510
28_	Max. radial load [mm from flange]	N	65.3 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		11
31_	Weight of motor	g	385
32_	Typical noise level	dBA	48

Operating Range



maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
351_GPX 37 A	1–2	433_ENX 10 EASY/QUAD	487_ESCON Module 50/5
352_GPX 37 LN/LZ	1–2	434_ENX 10 EASY XT	488_ESCON Module 50/8 HE
353_GPX 42 C	1–4	436_ENX 16 EASY	489_ESCON 50/5
353_GPX 42 UP	1–4	437_ENX 16 EASY XT	489_ESCON 70/10
		438_ENX 16 EASY Abs.	496_EPOS4 Mod./Comp. 50/5
		439_ENX 16 EASY Abs. XT	497_EPOS4 Mod./Comp. 50/8
		443_ENX 16 RIO	501_EPOS4 50/5
		470_ENC AEDL 5810	501_EPOS4 70/15
		471_ENC 30 HEDS 5540	504_EPOS2 P 24/5
		477_ENC 30 HEDL 5540	

Configuration

Bearing: Ball bearings preloaded
Commutation: Graphite brushes
Flange front/back: Standard flange/configurable flange/no flange
Shaft front/back: Length/diameter/flat face
Electric connection: Terminals or cable/alignment of connection/cable length/connector type

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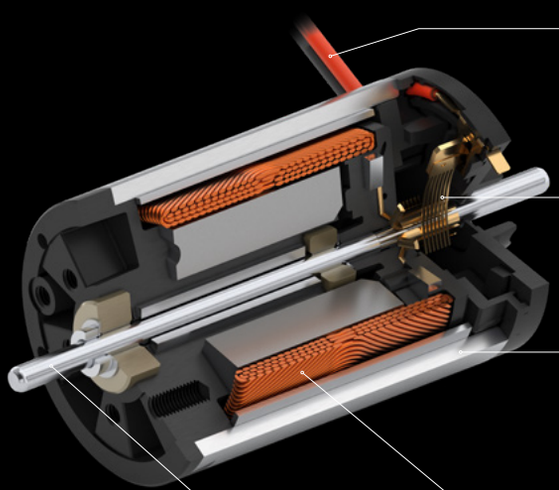
maxon DC-max

maxon DC-max

Strong neodymium magnet, state-of-the-art winding technology, cost-optimized design, economical manufacturing: The brushed maxon DC-max motors feature maximum performance at minimum volume and an unrivaled price-performance ratio. Choose between graphite and precious metal brushes, sintered and ball bearings, and many other components.

Key data

Motor ∅	16 ... 26 mm
Motor length	25.4 ... 44.7 mm
Power	2 ... 22 W
Nominal torque	up to 32.7 mNm
Max. permissible speed	up to 11000 rpm



Electrical connection with terminals, cables and connectors, depending on the size.

Commutation with precious metal brushes for fine rotary motion or graphite brushes for heavy-duty use.

In a hybrid process, a stator is formed by assembling the motor housing and magnet in one step using injection molding of PPA plastic. Sintered bearings or ball bearings.

Highly efficient ironless winding, system maxon – different nominal voltages available.

Stainless steel shaft with high stiffness; various modification options available.

- → The cost-effective alternative to the DCX program
- → High performance at a low cost
- → Combines the rational manufacturing and design of A-max motors with the higher power density offered by NdFeB magnets
- → Automated manufacturing process
- → Easily configured online

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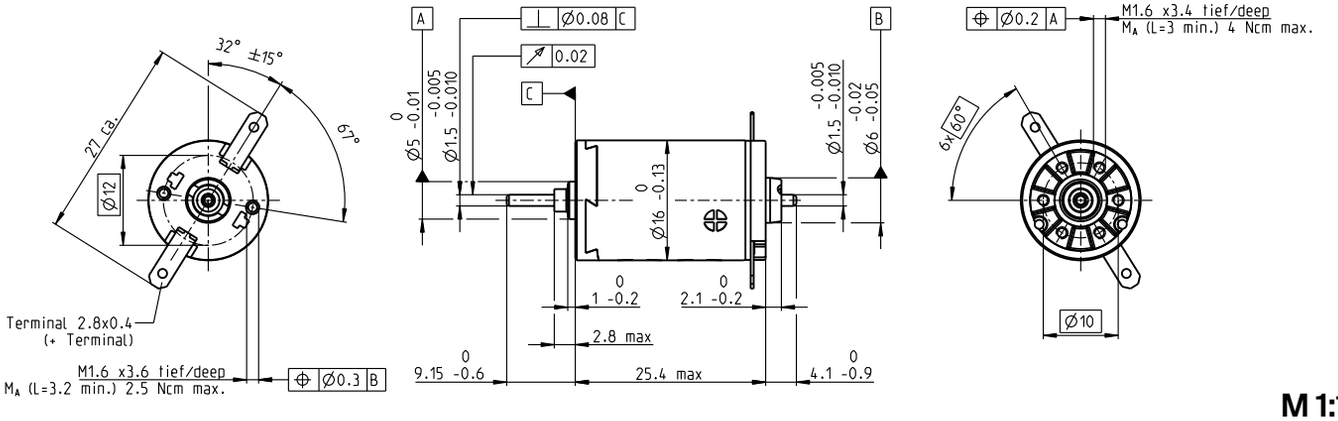
DC-max 16 S Precious Metal Brushes
DC motor ∅16 mm

Key Data: 2/4.3 W, 4.1 mNm, 11000 rpm



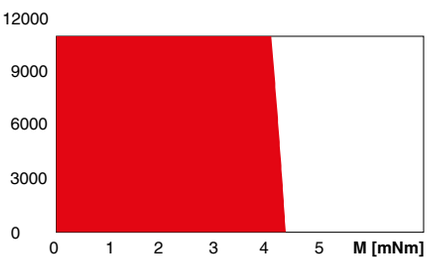
M 1:1

	Motor Data				
1_	Nominal voltage	V	6	12	24
2_	No load speed	rpm	7890	7560	7470
3_	No load current	mA	14.7	6.90	3.40
4_	Nominal speed	rpm	4830	4390	4210
5_	Nominal torque (max. continuous torque)	mNm	4.06	3.92	3.80
6_	Nominal current (max. continuous current)	A	0.577	0.267	0.128
7_	Stall torque	mNm	10.5	9.44	8.75
8_	Stall current	A	1.46	0.629	0.289
9_	Max. efficiency	%	81	80	80
10_	Terminal resistance	Ω	4.10	19.1	83.2
11_	Terminal inductance	mH	0.140	0.610	2.49
12_	Torque constant	mNm/A	7.19	15.0	30.3
13_	Speed constant	rpm/V	1330	637	315
14_	Speed/torque gradient	rpm/mNm	758	809	864
15_	Mechanical time constant	ms	8.87	8.92	9.00
16_	Rotor inertia	gcm²	1.12	1.05	0.994

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	29.8
18_	Thermal resistance winding-housing	K/W	5.5
19_	Thermal time constant winding	s	5.35
20_	Thermal time constant motor	s	288
21_	Ambient temperature	°C	-30...+65
22_	Max. winding temperature	°C	85
	Mechanical data ball bearings		
23_	Max. speed	rpm	11000
24_	Axial play	mm	0.05...0.15
	Preload	N	0
25_	Radial play	mm	0.025
26_	Max. axial load (dynamic)	N	2.2
27_	Max. force for press fits (static)	N	30
	(static, shaft supported)	N	200
28_	Max. radial load [mm from flange]	N	7.8 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	11000
24_	Axial play	mm	0.05...0.15
	Preload	N	0
25_	Radial play	mm	0.012
26_	Max. axial load (dynamic)	N	0.8
27_	Max. force for press fits (static)	N	35
	(static, shaft supported)	N	200
28_	Max. radial load [mm from flange]	N	1.4 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		7
31_	Weight of motor	g	23.3

Operating Range

n [rpm] Winding 12 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
331_GPX 16 A/C	1–2 [3–4]	433_ENX 10 QUAD	486_ESCON Module 24/2
332_GPX 16 LN/LZ	1–2 [3–4]	433_ENX 10 EASY	486_ESCON 36/2 DC
335_GPX 19 A/C	3–4		496_EPOS4 Mod./Comp. 24/1.5
336_GPX 19 LN/LZ	3–4		

Configuration

Bearing: Sleeve bearings/ball bearings
Commutation: Precious metal brushes with CLL/Graphite Brushes
Shaft front/back: Length
Electric connection: Terminals/cable

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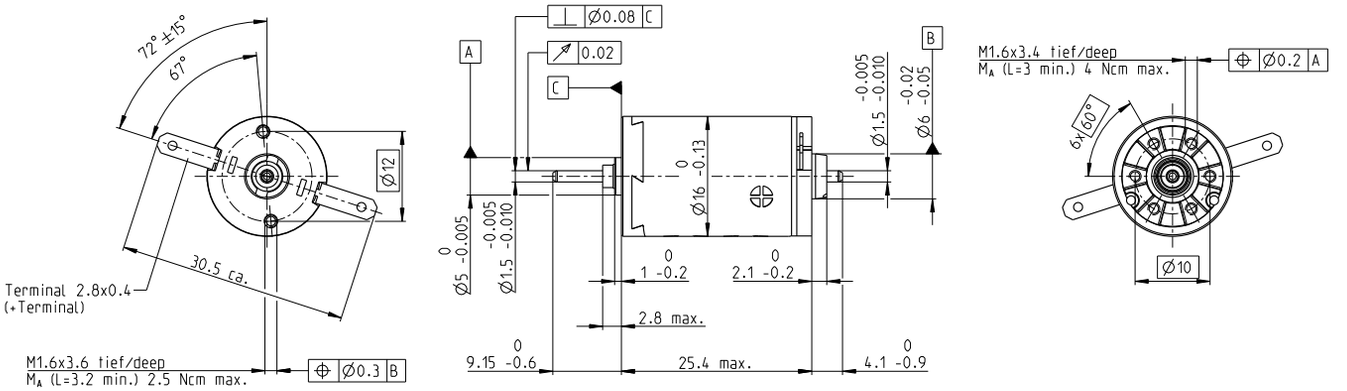
DC-max 16 S Graphite Brushes
DC motor ∅16 mm

DC-max

Key Data: 3/4.7 W, 4.8 mNm, 11 000 rpm



M 1:1

	Motor Data				
1_	Nominal voltage	V	6	12	24
2_	No load speed	rpm	9870	9860	9920
3_	No load current	mA	67.3	33.6	16.8
4_	Nominal speed	rpm	6770	6200	6580
5_	Nominal torque (max. continuous torque)	mNm	3.71	4.31	4.76
6_	Nominal current (max. continuous current)	A	0.720	0.413	0.227
7_	Stall torque	mNm	12.1	11.9	14.4
8_	Stall current	A	2.15	1.05	0.64
9_	Max. efficiency	%	68	68	71
10_	Terminal resistance	Ω	2.79	11.4	37.5
11_	Terminal inductance	mH	0.086	0.343	1.37
12_	Torque constant	mNm/A	5.62	11.2	22.5
13_	Speed constant	rpm/V	1700	849	424
14_	Speed/torque gradient	rpm/mNm	843	858	707
15_	Mechanical time constant	ms	8.85	8.92	8.57
16_	Rotor inertia	gcm²	1.00	0.993	1.16

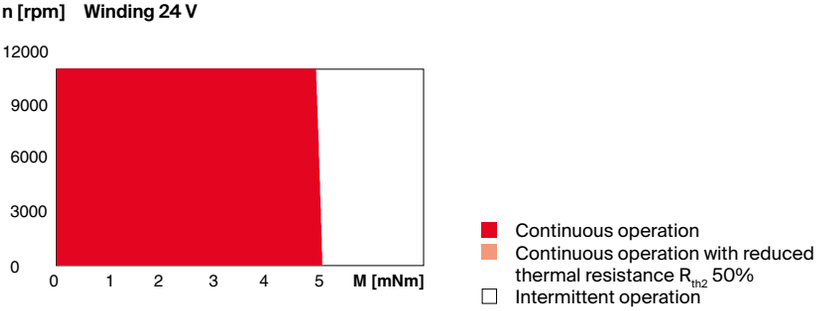
	Thermal data		
17_	Thermal resistance housing-ambient	K/W	29.8
18_	Thermal resistance winding-housing	K/W	5.5
19_	Thermal time constant winding	s	5.35
20_	Thermal time constant motor	s	288
21_	Ambient temperature	°C	-30...+85
22_	Max. winding temperature	°C	125

	Mechanical data ball bearings		
23_	Max. speed	rpm	11000
24_	Axial play	mm	0.05...0.15
	Preload	N	0
25_	Radial play	mm	0.025
26_	Max. axial load (dynamic)	N	2.2
27_	Max. force for press fits (static)	N	30
	(static, shaft supported)	N	200
28_	Max. radial load [mm from flange]	N	7.8 [5]

	Mechanical data sleeve bearings		
23_	Max. speed	rpm	11000
24_	Axial play	mm	0.05...0.15
	Preload	N	
25_	Radial play	mm	0.012
26_	Max. axial load (dynamic)	N	0.8
27_	Max. force for press fits (static)	N	35
	(static, shaft supported)	N	200
28_	Max. radial load [mm from flange]	N	1.4 [5]

	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		7
31_	Weight of motor	g	23.1

Operating Range



maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
331_GPX 16 A/C	1–2 [3–4]	433_ENX 10 QUAD	486_ESCON Module 24/2
332_GPX 16 LN/LZ	1–2 [3–4]	433_ENX 10 EASY	486_ESCON 36/2 DC
335_GPX 19 A/C	3–4		496_EPOS4 Mod./Comp. 24/1.5
336_GPX 19 LN/LZ	3–4		

Configuration

Bearing: Sleeve bearings/ball bearings
Commutation: Precious metal brushes with CLL/Graphite Brushes
Shaft front/back: Length
Electric connection: Terminals/cable

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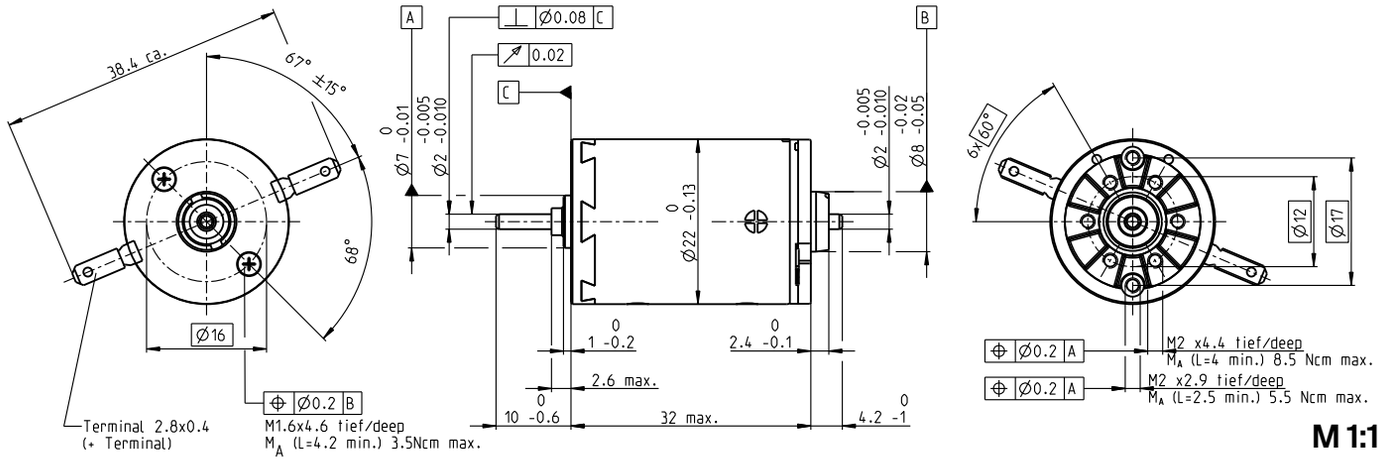
DC-max 22 S Precious Metal Brushes
DC motor ∅22 mm

Key Data: 5/9.6 W, 10.4 mNm, 9000 rpm



M 1:1

	Motor Data				
1_	Nominal voltage	V	6	12	24
2_	No load speed	rpm	5480	5890	5090
3_	No load current	mA	20.8	11.7	4.62
4_	Nominal speed	rpm	4280	4240	3440
5_	Nominal torque (max. continuous torque)	mNm	8.54	10.3	10.4
6_	Nominal current (max. continuous current)	A	0.840	0.543	0.236
7_	Stall torque	mNm	39.0	36.9	33.3
8_	Stall current	A	3.75	1.91	0.721
9_	Max. efficiency	%	85.7	85.2	84.9
10_	Terminal resistance	Ω	1.60	6.28	33.3
11_	Terminal inductance	mH	0.119	0.413	2.21
12_	Torque constant	mNm/A	10.4	19.3	44.8
13_	Speed constant	rpm/V	919	494	213
14_	Speed/torque gradient	rpm/mNm	141	160	159
15_	Mechanical time constant	ms	8.44	8.36	8.39
16_	Rotor inertia	gcm²	5.70	4.98	5.05

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	20
18_	Thermal resistance winding-housing	K/W	6
19_	Thermal time constant winding	s	16.8
20_	Thermal time constant motor	s	538
21_	Ambient temperature	°C	-30...65
22_	Max. winding temperature	°C	85

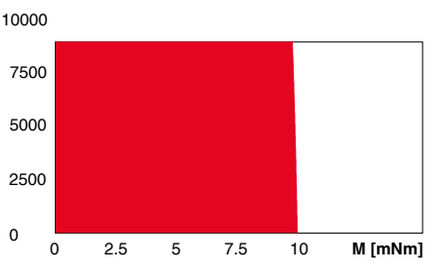
	Mechanical data ball bearings		
23_	Max. speed	rpm	9000
24_	Axial play	mm	0.05...0.15
	Preload	N	0
25_	Radial play	mm	0.025
26_	Max. axial load (dynamic)	N	3.3
27_	Max. force for press fits (static)	N	45
	(static, shaft supported)	N	420
28_	Max. radial load [mm from flange]	N	12.3 [5]

	Mechanical data sleeve bearings		
23_	Max. speed	rpm	9000
24_	Axial play	mm	0.05...0.15
	Preload	N	0
25_	Radial play	mm	0.012
26_	Max. axial load (dynamic)	N	1
27_	Max. force for press fits (static)	N	80
	(static, shaft supported)	N	420
28_	Max. radial load [mm from flange]	N	2.8 [5]

	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		9
31_	Weight of motor	g	53.8

Operating Range

n [rpm] Winding 12 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
339_GPX 22 A/C	1–2 [3–4]	433_ENX 10 QUAD	486_ESCON Module 24/2
340_GPX 22 LN/LZ	1–2 [3–4]	433_ENX 10 EASY	486_ESCON 36/2 DC
344_GPX 26 A/C	3		496_EPOS4 Mod./Comp. 24/1.5
345_GPX 26 LN/LZ	3		

Configuration

Bearing: Sleeve bearings/ball bearings
Commutation: Precious metal brushes with CLL/Graphite Brushes
Shaft front/back: Length
Electric connection: Terminals/cable

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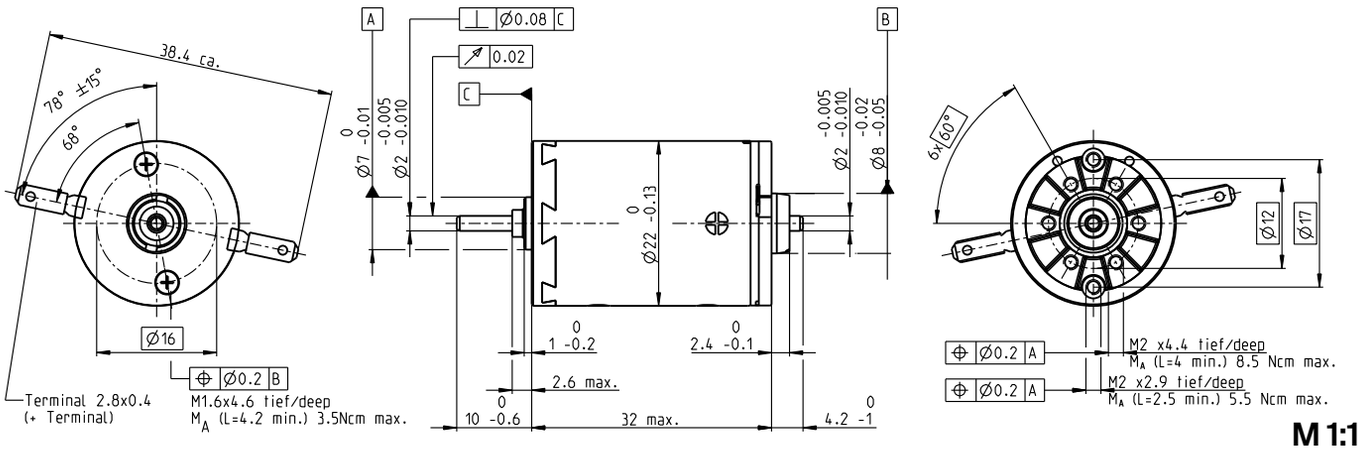
DC-max 22 S Graphite Brushes
DC motor ∅22 mm

Key Data: 8/10 W, 12.5 mNm, 9000 rpm



M 1:1

	Motor Data				
1_	Nominal voltage	V	6	12	24
2_	No load speed	rpm	7030	7140	7330
3_	No load current	mA	58.8	29.5	15.1
4_	Nominal speed	rpm	4950	5240	5350
5_	Nominal torque (max. continuous torque)	mNm	11.5	12.6	11.8
6_	Nominal current (max. continuous current)	A	1.52	0.825	0.398
7_	Stall torque	mNm	42.4	49.4	44.6
8_	Stall current	A	5.39	3.14	1.45
9_	Max. efficiency	%	76	80	80
10_	Terminal resistance	Ω	1.11	3.83	16.6
11_	Terminal inductance	mH	0.069	0.274	1.05
12_	Torque constant	mNm/A	7.88	15.8	30.8
13_	Speed constant	rpm/V	1210	606	310
14_	Speed/torque gradient	rpm/mNm	171	147	167
15_	Mechanical time constant	ms	9.09	8.57	8.20
16_	Rotor inertia	gcm²	5.07	5.57	4.69

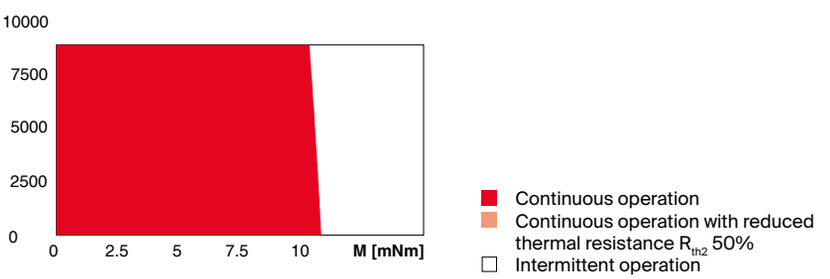
	Thermal data		
17_	Thermal resistance housing-ambient	K/W	20
18_	Thermal resistance winding-housing	K/W	6
19_	Thermal time constant winding	s	16.8
20_	Thermal time constant motor	s	538
21_	Ambient temperature	°C	-30...85
22_	Max. winding temperature	°C	125

	Mechanical data ball bearings		
23_	Max. speed	rpm	9000
24_	Axial play	mm	0.05...0.15
	Preload	N	0
25_	Radial play	mm	0.025
26_	Max. axial load (dynamic)	N	3.3
27_	Max. force for press fits (static)	N	45
	(static, shaft supported)	N	420
28_	Max. radial load [mm from flange]	N	12.3 [5]

	Mechanical data sleeve bearings		
23_	Max. speed	rpm	9000
24_	Axial play	mm	0.05...0.15
	Preload	N	0
25_	Radial play	mm	0.012
26_	Max. axial load (dynamic)	N	1
27_	Max. force for press fits (static)	N	80
	(static, shaft supported)	N	420
28_	Max. radial load [mm from flange]	N	2.8 [5]

	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		9
31_	Weight of motor	g	53.8

Operating Range



maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
339_GPX 22 A/C	1–2 [3–4]	433_ENX 10 QUAD	486_ESCON Module 24/2
340_GPX 22 LN/LZ	1–2 [3–4]	433_ENX 10 EASY	486_ESCON 36/2 DC
344_GPX 26 A/C	3		496_EPOS4 Mod./Comp. 24/1.5
345_GPX 26 LN/LZ	3		

Configuration

Bearing: Sleeve bearings/ball bearings
Commutation: Precious metal brushes with CLL/Graphite Brushes
Shaft front/back: Length
Electric connection: Terminals/cable

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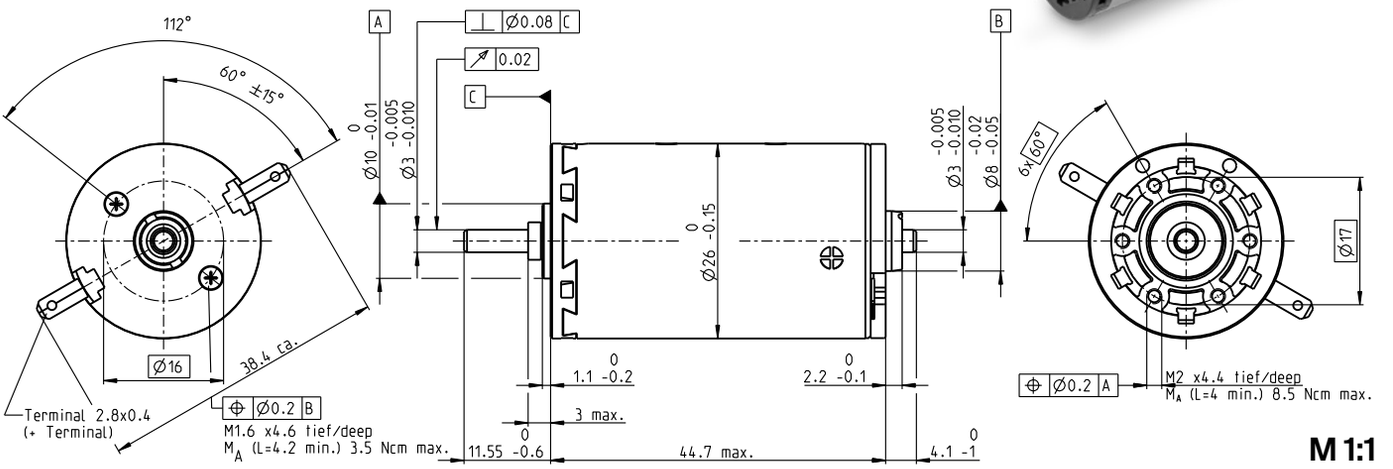
DC-max 26 S Precious Metal Brushes
DC motor ∅26 mm

Key Data: 9/12 W, 28.8 mNm, 6700 rpm

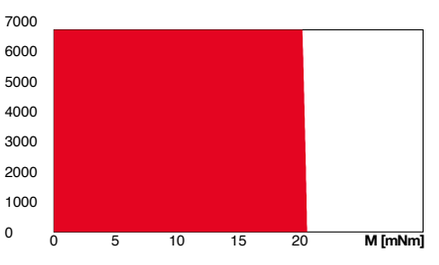


M 1:1

	Motor Data			
1_	Nominal voltage	V	12	24
2_	No load speed	rpm	4460	4370
3_	No load current	mA	27.1	13.2
4_	Nominal speed	rpm	3790	3450
5_	Nominal torque (max. continuous torque)	mNm	20.8	28.8
6_	Nominal current (max. continuous current)	A	0.84	0.564
7_	Stall torque	mNm	140	138
8_	Stall current	A	5.49	2.64
9_	Max. efficiency	%	87	87
10_	Terminal resistance	Ω	2.19	9.08
11_	Terminal inductance	mH	0.278	1.16
12_	Torque constant	mNm/A	25.6	52.2
13_	Speed constant	rpm/V	373	183
14_	Speed/torque gradient	rpm/mNm	31.9	31.8
15_	Mechanical time constant	ms	4.99	5.06
16_	Rotor inertia	gcm²	14.9	15.2
	Thermal data			
17_	Thermal resistance housing-ambient	K/W	13.2	
18_	Thermal resistance winding-housing	K/W	3.2	
19_	Thermal time constant winding	s	17.8	
20_	Thermal time constant motor	s	350	
21_	Ambient temperature	°C	-30...65	
22_	Max. winding temperature	°C	85	
	Mechanical data ball bearings			
23_	Max. speed	rpm	6700	
24_	Axial play	mm	0.1...0.2	
	Preload	N	0	
25_	Radial play	mm	0.025	
26_	Max. axial load (dynamic)	N	5	
27_	Max. force for press fits (static)	N	75	
	(static, shaft supported)	N	1200	
28_	Max. radial load [mm from flange]	N	20 [5]	
	Mechanical data sleeve bearings			
23_	Max. speed	rpm	6700	
24_	Axial play	mm	0.1...0.2	
	Preload	N	0	
25_	Radial play	mm	0.012	
26_	Max. axial load (dynamic)	N	1.7	
27_	Max. force for press fits (static)	N	80	
	(static, shaft supported)	N	1200	
28_	Max. radial load [mm from flange]	N	5.5 [5]	
	Other specifications			
29_	Number of pole pairs		1	
30_	Number of commutator segments		13	
31_	Weight of motor	g	120	

Operating Range

n [rpm] Winding 12 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
344_GPX 26 A/C	1–2 [3]	433_ENX 10 QUAD	486_ESCON Module 24/2
345_GPX 26 LN/LZ	1–2 [3]	436_ENX 16 EASY	486_ESCON 36/2 DC
347_GPX 32 A/C	3	438_ENX 16 EASY Abs.	487_ESCON Module 50/5
348_GPX 32 LN/LZ	3		489_ESCON 50/5
			496_EPOS4 Mod./Comp. 24/1.5
			496_EPOS4 Mod./Comp. 50/5
			501_EPOS4 50/5
			504_EPOS2 P 24/5

Configuration

Bearing: Sleeve bearings/ball bearings
Commutation: Precious metal brushes with CLL/Graphite Brushes
Shaft front/back: Length
Electric connection: Terminals/cable

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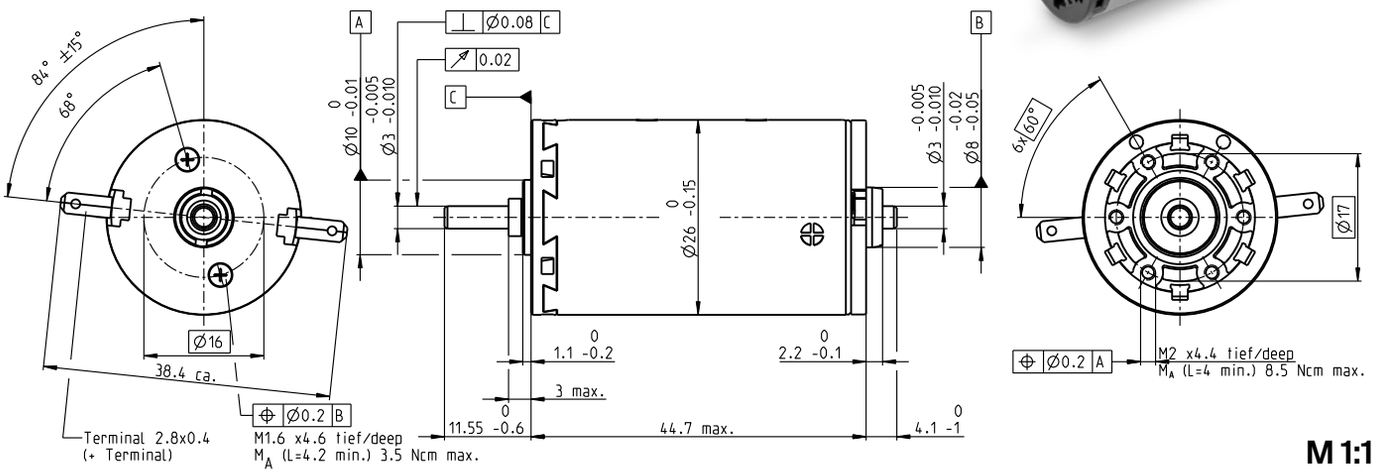
DC-max 26 S Graphite Brushes
DC motor ∅26 mm

Key Data: 22/29 W, 32.7 mNm, 11000 rpm

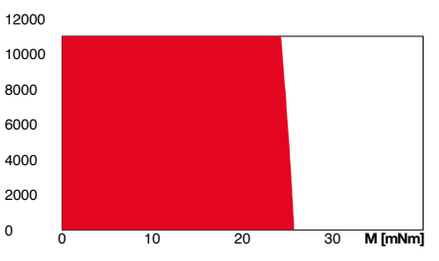


M 1:1

	Motor Data			
1_	Nominal voltage	V	24	48
2_	No load speed	rpm	8920	8730
3_	No load current	mA	53	25.7
4_	Nominal speed	rpm	8100	7840
5_	Nominal torque (max. continuous torque)	mNm	26.3	28.3
6_	Nominal current (max. continuous current)	A	1.08	0.567
7_	Stall torque	mNm	287	277
8_	Stall current	A	11.2	5.31
9_	Max. efficiency	%	87	87
10_	Terminal resistance	Ω	2.14	9.04
11_	Terminal inductance	mH	0.278	1.16
12_	Torque constant	mNm/A	25.6	52.2
13_	Speed constant	rpm/V	373	183
14_	Speed/torque gradient	rpm/mNm	31.2	31.6
15_	Mechanical time constant	ms	4.89	5.04
16_	Rotor inertia	gcm²	14.9	15.2
	Thermal data			
17_	Thermal resistance housing-ambient	K/W	13.2	
18_	Thermal resistance winding-housing	K/W	3.2	
19_	Thermal time constant winding	s	17.8	
20_	Thermal time constant motor	s	350	
21_	Ambient temperature	°C	-30...85	
22_	Max. winding temperature	°C	100	
	Mechanical data ball bearings			
23_	Max. speed	rpm	11000	
24_	Axial play	mm	0.1...0.2	
	Preload	N	0	
25_	Radial play	mm	0.025	
26_	Max. axial load (dynamic)	N	5	
27_	Max. force for press fits (static)	N	75	
	(static, shaft supported)	N	1200	
28_	Max. radial load [mm from flange]	N	20 [5]	
	Mechanical data sleeve bearings			
23_	Max. speed	rpm	11000	
24_	Axial play	mm	0.1...0.2	
	Preload	N	0	
25_	Radial play	mm	0.012	
26_	Max. axial load (dynamic)	N	1.7	
27_	Max. force for press fits (static)	N	80	
	(static, shaft supported)	N	1200	
28_	Max. radial load [mm from flange]	N	5.5 [5]	
	Other specifications			
29_	Number of pole pairs		1	
30_	Number of commutator segments		13	
31_	Weight of motor	g	120	

Operating Range

n [rpm] Winding 24 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Intermittent operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
344_GPX 26 A/C	1–2 [3]	433_ENX 10 QUAD	486_ESCON Module 24/2
345_GPX 26 LN/LZ	1–2 [3]	436_ENX 16 EASY	486_ESCON 36/2 DC
347_GPX 32 A/C	3	438_ENX 16 EASY Abs.	487_ESCON Module 50/5
348_GPX 32 LN/LZ	3		489_ESCON 50/5
			496_EPOS4 Mod./Comp. 24/1.5
			496_EPOS4 Mod./Comp. 50/5
			501_EPOS4 50/5
			504_EPOS2 P 24/5

Configuration

Bearing: Sleeve bearings/ball bearings
Commutation: Precious metal brushes with CLL/Graphite Brushes
Shaft front/back: Length
Electric connection: Terminals/cable

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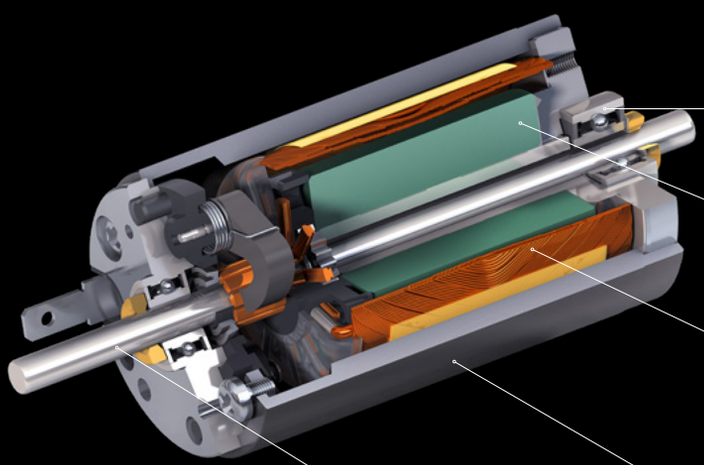
maxon RE

maxon RE

maxon brushed RE-motors are high-quality DC motors, equipped with powerful permanent magnets. The centerpiece of the motor is the ironless rotor. This means cutting-edge technology for compact, powerful drives with low inertia. As a result of the low mass moment of inertia, the DC motors feature high acceleration.

Key data

Motor ∅	6 ... 65 mm
Motor length	15.6 ... 131.4 mm
Power	0.3 ... 250 W
Nominal torque	up to 888 mNm
Max. permissible speed	up to 23 000 rpm



Sintered bearings or ball bearings.

Equipped with powerful NdFeB permanent magnet.

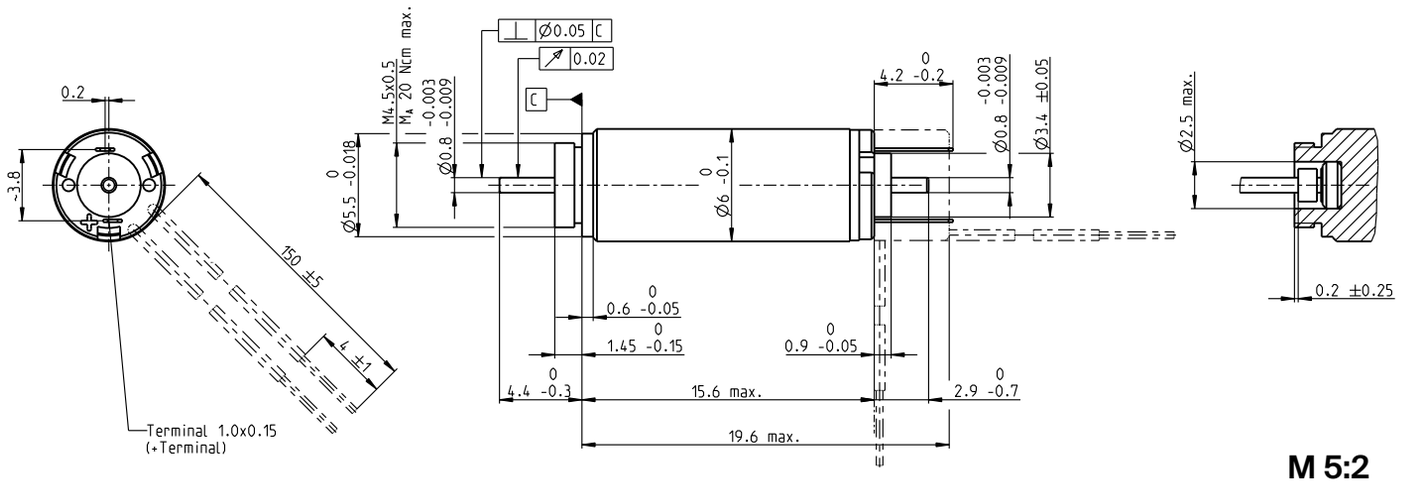
Highly efficient ironless winding. Different nominal voltages available.

Magnetic return painted black for optimum heat dissipation. Commutation with precious metal brushes for fine rotary motion or graphite brushesfor heavy-duty use.

Stainless steel shaft with high stiffness. No recesses; the stress concentration is eliminated.

- → High power density
- → High-quality DC motor with NdFeB magnet
- → High speeds and torques
- → Robust design (metal flange)

RE 6 ∅6 mm, Precious Metal Brushes, 0.3 Watt



M 5:2

RE

Stock program
Standard program
Special program (on request)

		Part Numbers			
B with cables		386780	386781	386782	386783
A with terminals		349189	349190	349191	349192
Motor Data					
	Values at nominal voltage				
1	Nominal voltage	V	1.5	3	4.5	6
2	No load speed	rpm	18500	18600	18600	18600
3	No load current	mA	42.6	21.3	14.2	10.7
4	Nominal speed	rpm	4680	5670	5400	5340
5	Nominal torque (max. continuous torque)	mNm	0.302	0.324	0.318	0.316
6	Nominal current (max. continuous current)	A	0.453	0.242	0.158	0.118
7	Stall torque	mNm	0.419	0.485	0.469	0.465
8	Stall current	A	0.581	0.336	0.217	0.161
9	Max. efficiency	%	54	56	56	56
	Characteristics					
10	Terminal resistance	Ω	2.58	8.92	20.8	37.2
11	Terminal inductance	mH	0.023	0.091	0.204	0.363
12	Torque constant	mNm/A	0.72	1.44	2.16	2.88
13	Speed constant	rpm/V	13300	6630	4420	3310
14	Speed / torque gradient	rpm/mNm	47500	41000	42400	42700
15	Mechanical time constant	ms	7.45	7.18	7.24	7.24
16	Rotor inertia	gcm²	0.015	0.0167	0.0163	0.0162

Specifications

Thermal data

17	Thermal resistance housing-ambient	77 K/W
18	Thermal resistance winding-housing	16.2 K/W
19	Thermal time constant winding	1.39 s
20	Thermal time constant motor	16.3 s
21	Ambient temperature	-20...+65°C
22	Max. winding temperature	+85°C

Mechanical data (sleeve bearings)

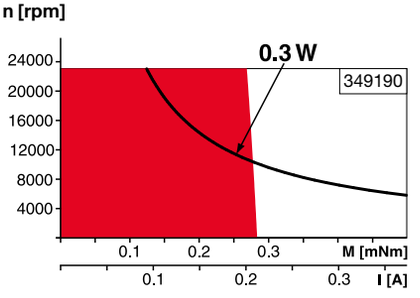
23	Max. speed	23000 rpm
24	Axial play	0.02 - 0.1 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	0.15 N
27	Max. force for press fits (static)	10 N
28	Max. radial load, 4 mm from flange	0.6 N

Other specifications

29	Number of pole pairs	1
30	Number of commutator segments	5
31	Weight of motor	2.3 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

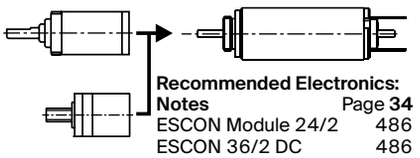
Assigned power rating

maxon Modular System

Details on catalog page 34

Planetary Gearhead
∅6 mm
0.002 - 0.03 Nm
Page 358

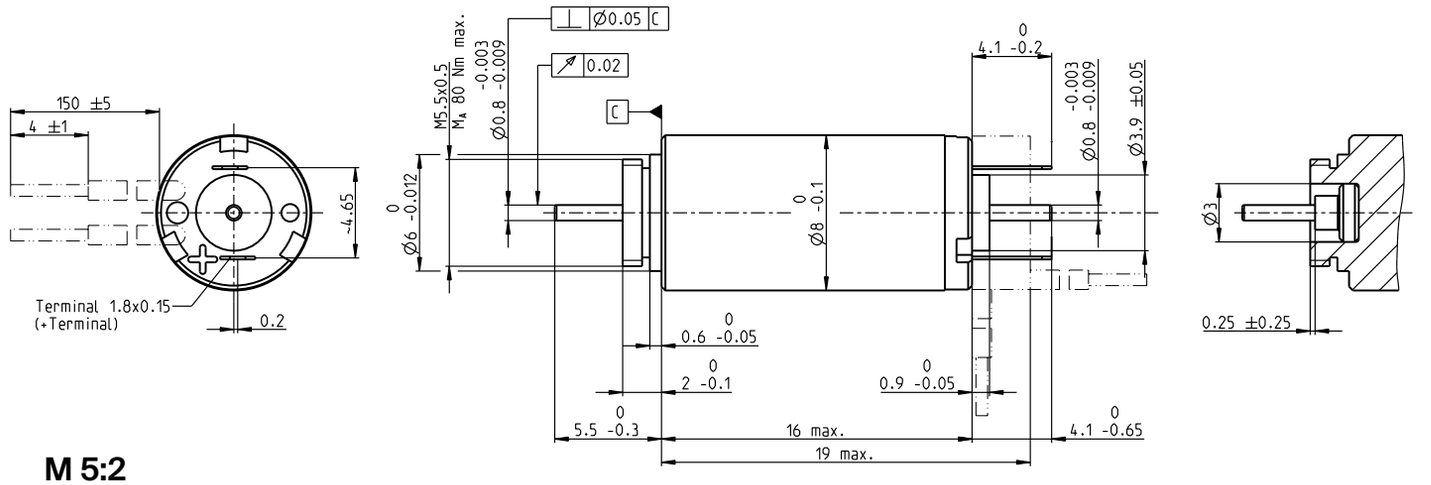
Screw Drive
∅6 mm
Page 407–408



Recommended Electronics:

Notes	Page **34**
ESCON Module 24/2	486
ESCON 36/2 DC	486

RE 8 ∅8 mm, Precious Metal Brushes, 0.5 Watt



M 5:2

Stock program
Standard program
Special program (on request)

		Part Numbers							
B with cables		462207	463219	463220	463221	463222	463223		
A with terminals		347723	347724	347725	347728	347726	347727		
Motor Data									
	Values at nominal voltage								
1	Nominal voltage	V	2.4	4.2	6	7.2	9	12	
2	No load speed	rpm	13900	14200	13300	14300	14400	15600	
3	No load current	mA	19.2	11.2	7.3	6.66	5.35	4.44	
4	Nominal speed	rpm	4320	4480	3500	4220	4760	5410	
5	Nominal torque (max. continuous torque)	mNm	0.63	0.624	0.616	0.596	0.626	0.589	
6	Nominal current (max. continuous current)	A	0.412	0.237	0.155	0.134	0.113	0.0865	
7	Stall torque	mNm	0.925	0.932	0.857	0.866	0.957	0.925	
8	Stall current	A	0.581	0.34	0.207	0.187	0.166	0.13	
9	Max. efficiency	%	67	67	66	66	68	67	
	Characteristics								
10	Terminal resistance	Ω	4.13	12.3	29	38.5	54.3	92.2	
11	Terminal inductance	mH	0.03	0.09	0.206	0.257	0.4	0.606	
12	Torque constant	mNm/A	1.59	2.74	4.15	4.63	5.77	7.11	
13	Speed constant	rpm/V	6000	3490	2300	2060	1650	1340	
14	Speed / torque gradient	rpm/mNm	15600	15700	16100	17200	15500	17400	
15	Mechanical time constant	ms	6.31	6.3	6.34	6.44	6.29	6.49	
16	Rotor inertia	gcm²	0.0388	0.0383	0.0375	0.0358	0.0387	0.0355	

Specifications

Thermal data

17	Thermal resistance housing-ambient	48 K/W
18	Thermal resistance winding-housing	22 K/W
19	Thermal time constant winding	2.96 s
20	Thermal time constant motor	21.3 s
21	Ambient temperature	-20...+65°C
22	Max. winding temperature	+85°C

Mechanical data (sleeve bearings)

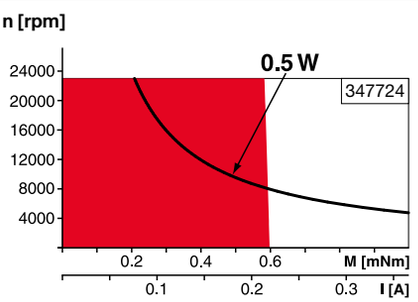
23	Max. speed	23000 rpm
24	Axial play	0.02 - 0.1 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	0.15 N
27	Max. force for press fits (static)	10 N
28	Max. radial load, 4 mm from flange	0.6 N

Other specifications

29	Number of pole pairs	1
30	Number of commutator segments	5
31	Weight of motor	4.0 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

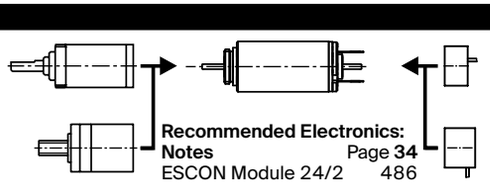
Assigned power rating

maxon Modular System

Details on catalog page 34

Planetary Gearhead
∅8 mm
0.01 - 0.1 Nm
Page 359

Screw Drive
∅8 mm
Page 409–410



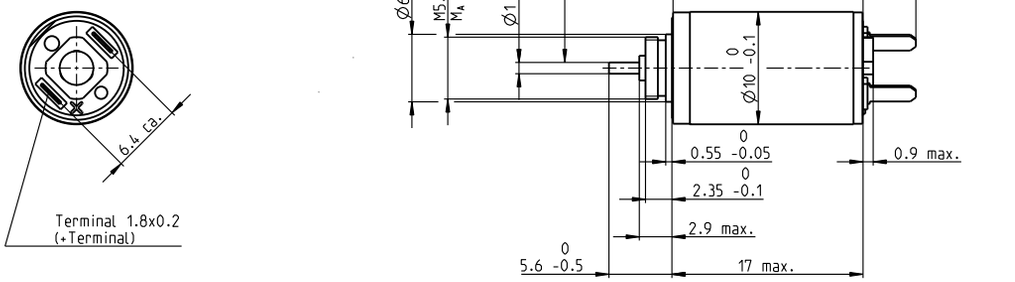
Recommended Electronics:

Notes	Page **34**
ESCON Module 24/2	486
ESCON 36/2 DC	486
EPOS4 Mod./Comp. 24/1.5	496

for type A:
Encoder MR
100 CPT, 2 channels
Page 458

for type A:
Encoder 8 OPT
50 CPT, 2 channels
Page 465

RE 10 ∅10 mm, Precious Metal Brushes, 0.75 Watt



M 3:2

Stock program
Standard program
Special program (on request)

			Part Numbers									
			118382	118383	118384	118385	118386	118387	118388	118389	118390	118391
Motor Data												
	Values at nominal voltage											
1	Nominal voltage	V	2.4	3	3.6	4.5	6	6	7.2	7.2	9	12
2	No load speed	rpm	13000	11100	9930	11300	13000	11400	11400	10600	10700	11600
3	No load current	mA	16.1	13	10.4	9.34	8.07	7.04	6.04	5.46	4.44	3.59
4	Nominal speed	rpm	1630	1990	1500	2950	4670	3150	3340	2300	2000	2790
5	Nominal torque (max. continuous torque)	mNm	0.757	0.789	0.784	0.787	0.784	0.8	0.784	0.718	0.757	0.746
6	Nominal current (max. continuous current)	A	0.367	0.306	0.243	0.222	0.19	0.17	0.143	0.119	0.101	0.081
7	Stall torque	mNm	0.924	1	0.949	1.09	1.25	1.13	1.12	0.944	0.957	1.01
8	Stall current	A	0.432	0.375	0.284	0.297	0.292	0.232	0.198	0.15	0.123	0.106
9	Max. efficiency	%	66	67	66	68	69	68	68	66	66	67
	Characteristics											
10	Terminal resistance	Ω	5.55	8	12.7	15.2	20.6	25.8	36.4	47.9	72.9	114
11	Terminal inductance	mH	0.046	0.072	0.112	0.136	0.184	0.24	0.325	0.398	0.605	0.92
12	Torque constant	mNm/A	2.14	2.67	3.34	3.67	4.27	4.88	5.68	6.28	7.75	9.55
13	Speed constant	rpm/V	4470	3570	2860	2600	2230	1960	1680	1520	1230	1000
14	Speed / torque gradient	rpm/mNm	11600	10700	10800	10700	10700	10400	10800	11600	11600	11900
15	Mechanical time constant	ms	7.97	7.96	7.95	7.9	7.9	7.85	7.93	8.04	8.04	8.11
16	Rotor inertia	gcm²	0.066	0.0711	0.0704	0.0706	0.0706	0.0726	0.0706	0.0666	0.0666	0.0654

Specifications

Thermal data

17	Thermal resistance housing-ambient	45.5 K/W
18	Thermal resistance winding-housing	19.5 K/W
19	Thermal time constant winding	3.16 s
20	Thermal time constant motor	108 s
21	Ambient temperature	-20...+65°C
22	Max. winding temperature	+85°C

Mechanical data (sleeve bearings)

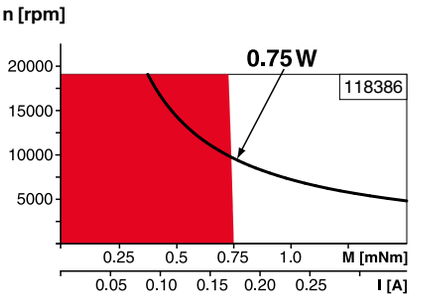
23	Max. speed	19000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	0.15 N
27	Max. force for press fits (static)	15 N
28	Max. radial load, 4 mm from flange	0.4 N

Other specifications

29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	7 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

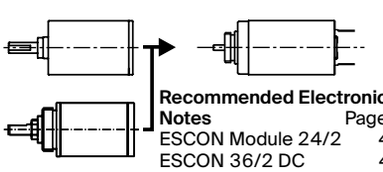
Assigned power rating

maxon Modular System

Details on catalog page 34

Planetary Gearhead
∅10 mm
0.005 - 0.1 Nm
Page 360

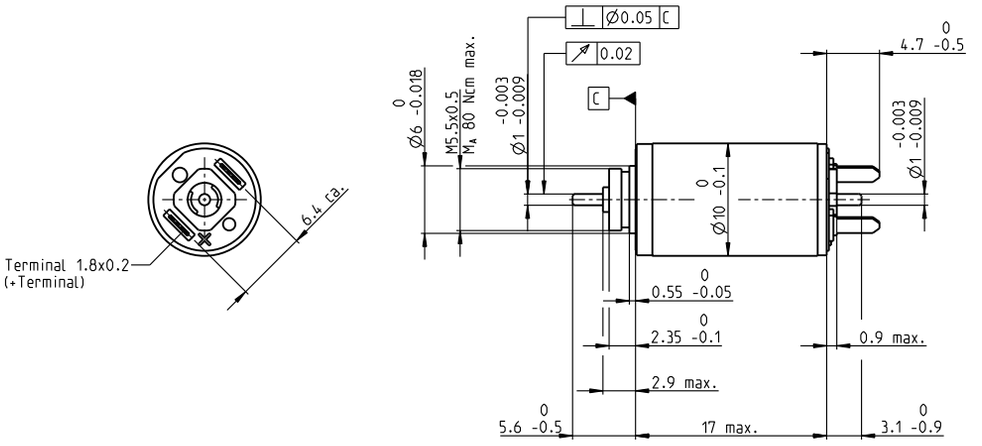
Planetary Gearhead
∅10 mm
0.01 - 0.15 Nm
Page 361



Recommended Electronics:

Notes	Page **34**
ESCON Module 24/2	486
ESCON 36/2 DC	486

RE 10 ∅10 mm, Precious Metal Brushes, 0.75 Watt



M 3:2

Stock program
Standard program
Special program (on request)

Part Numbers

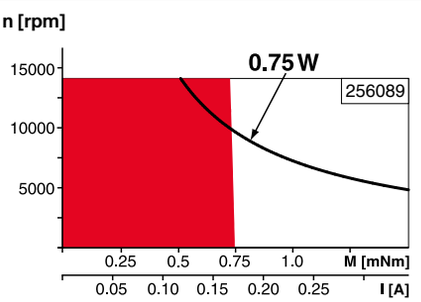
			256085	256086	256087	256088	256089	256090	256091	256092	256093	256094
Motor Data												
	Values at nominal voltage											
1	Nominal voltage	V	2.4	3	3.6	4.5	6	6	7.2	7.2	9	12
2	No load speed	rpm	10200	10300	9840	11200	12900	11300	11600	10500	10600	11500
3	No load current	mA	23.4	18.8	14.9	13.9	11.8	10.5	8.86	8.01	6.51	5.37
4	Nominal speed	rpm	1630	1990	1500	2950	4680	3160	3350	1860	2000	2790
5	Nominal torque (max. continuous torque)	mNm	0.742	0.775	0.769	0.771	0.768	0.785	0.768	0.743	0.742	0.731
6	Nominal current (max. continuous current)	A	0.367	0.306	0.243	0.222	0.19	0.17	0.143	0.125	0.101	0.081
7	Stall torque	mNm	0.924	1	0.949	1.09	1.25	1.13	1.12	0.944	0.957	1.01
8	Stall current	A	0.432	0.375	0.284	0.297	0.292	0.232	0.198	0.15	0.123	0.106
9	Max. efficiency	%	59	61	60	62	64	62	62	60	60	60
	Characteristics											
10	Terminal resistance	Ω	5.55	8	12.7	15.2	20.6	25.8	36.4	47.9	72.9	114
11	Terminal inductance	mH	0.046	0.072	0.112	0.136	0.184	0.24	0.325	0.398	0.605	0.92
12	Torque constant	mNm/A	2.14	2.67	3.34	3.67	4.27	4.87	5.68	6.28	7.75	9.55
13	Speed constant	rpm/V	4470	3570	2860	2600	2230	1960	1680	1520	1230	1000
14	Speed / torque gradient	rpm/mNm	11600	10700	10800	10700	10700	10400	10800	11600	11600	11900
15	Mechanical time constant	ms	7.97	7.92	7.95	7.9	7.9	7.85	7.93	8.04	8.04	8.11
16	Rotor inertia	gcm²	0.066	0.0711	0.0704	0.0706	0.0706	0.0726	0.0706	0.0666	0.0666	0.0654

Specifications

	Thermal data	
17	Thermal resistance housing-ambient	45.5 K/W
18	Thermal resistance winding-housing	19.5 K/W
19	Thermal time constant winding	3.16 s
20	Thermal time constant motor	108 s
21	Ambient temperature	-20...+65°C
22	Max. winding temperature	+85°C
	Mechanical data (sleeve bearings)	
23	Max. speed	14 000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	0.15 N
27	Max. force for press fits (static)	15 N
28	Max. radial load, 4 mm from flange	0.4 N
	Other specifications	
29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	7 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 34

Planetary Gearhead
∅10 mm
0.005 - 0.1 Nm
Page 360

Planetary Gearhead
∅10 mm
0.01 - 0.15 Nm
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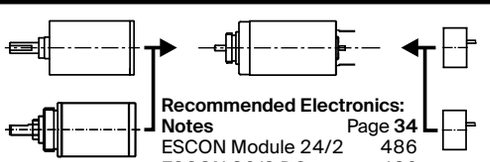


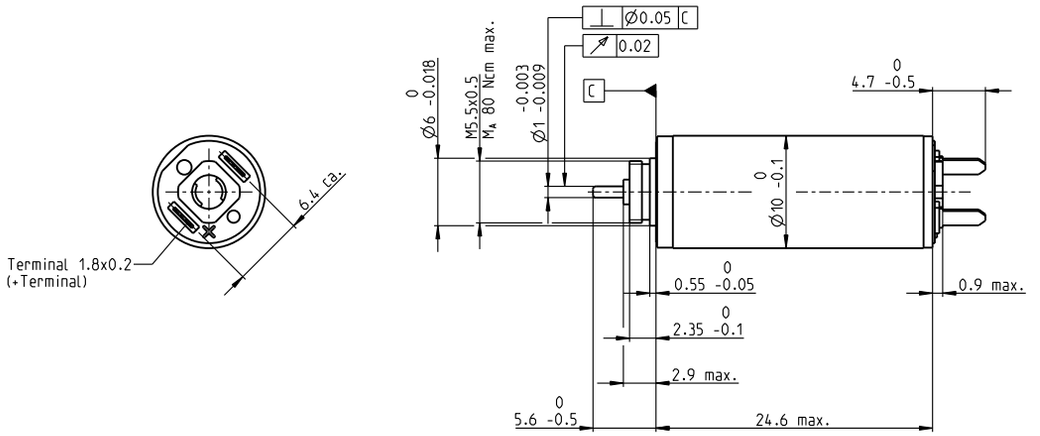
Recommended Electronics:

Notes	Page **34**
ESCON Module 24/2	486
ESCON 36/2 DC	486
EPOS4 Mod./Comp. 24/1.5	496

Encoder MR
16 CPT,
2 channels
Page 457

Encoder MR
64 - 256 CPT,
2 channels
Page 458

RE 10 ∅10 mm, Precious Metal Brushes, 1.5 Watt



M 3:2

Stock program
Standard program
Special program (on request)

Part Numbers	118392	118393	118394	118395	118396	118397	118398	118399	118400
Motor Data									
Values at nominal voltage									
1 Nominal voltage V	3	3	4.5	4.5	6	6	9	9	12
2 No load speed rpm	13000	10700	12800	10600	12400	9880	12200	11100	12500
3 No load current mA	23.9	18.5	15.5	12.1	11.1	8.33	7.27	6.42	5.67
4 Nominal speed rpm	6840	4430	6530	4210	6160	3880	6080	4990	6510
5 Nominal torque (max. continuous torque) mNm	1.5	1.49	1.48	1.47	1.5	1.57	1.53	1.54	1.54
6 Nominal current (max. continuous current) A	0.713	0.582	0.462	0.379	0.338	0.282	0.226	0.207	0.176
7 Stall torque mNm	3.12	2.52	3.04	2.47	3.01	2.61	3.08	2.83	3.24
8 Stall current A	1.44	0.963	0.919	0.619	0.66	0.458	0.444	0.371	0.36
9 Max. efficiency %	76	74	76	74	76	75	76	76	77
Characteristics									
10 Terminal resistance Ω	2.08	3.11	4.9	7.27	9.09	13.1	20.3	24.3	33.3
11 Terminal inductance mH	0.017	0.025	0.04	0.059	0.077	0.12	0.178	0.215	0.299
12 Torque constant mNm/A	2.16	2.62	3.3	3.99	4.56	5.7	6.95	7.63	9
13 Speed constant rpm/V	4410	3640	2890	2400	2100	1680	1370	1250	1060
14 Speed / torque gradient rpm/mNm	4240	4330	4280	4370	4180	3860	4010	3980	3930
15 Mechanical time constant ms	4.62	4.61	4.6	4.59	4.58	4.56	4.59	4.56	4.56
16 Rotor inertia gcm²	0.104	0.102	0.102	0.1	0.105	0.113	0.109	0.11	0.111

Specifications

Thermal data

17	Thermal resistance housing-ambient	37.5 K/W
18	Thermal resistance winding-housing	9.0 K/W
19	Thermal time constant winding	2.22 s
20	Thermal time constant motor	135 s
21	Ambient temperature	-20...+65°C
22	Max. winding temperature	+85°C

Mechanical data (sleeve bearings)

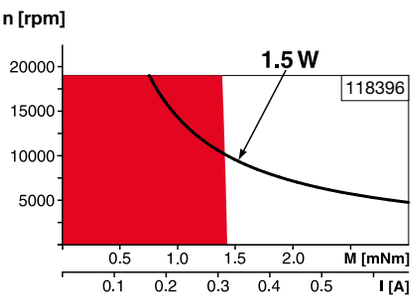
23	Max. speed	19 000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	0.15 N
27	Max. force for press fits (static)	15 N
28	Max. radial load, 4 mm from flange	0.4 N

Other specifications

29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	10 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 34

Planetary Gearhead
∅10 mm
0.005 - 0.1 Nm
Page 360

Planetary Gearhead
∅10 mm
0.01 - 0.15 Nm
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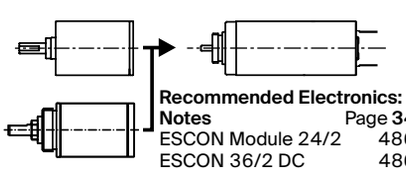
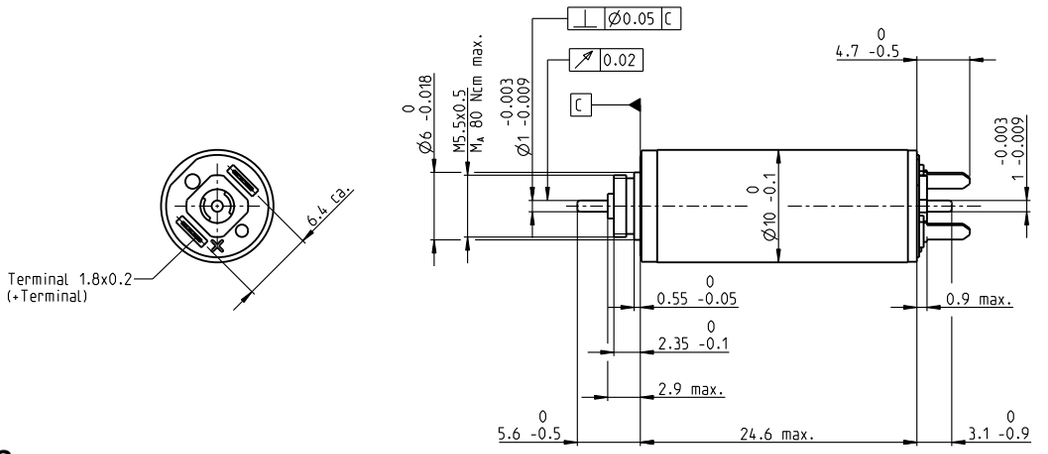


Recommended Electronics:

Notes	Page **34**
ESCON Module 24/2	486
ESCON 36/2 DC	486

RE 10 ∅10 mm, Precious Metal Brushes, 1.5 Watt



M 3:2

Stock program
Standard program
Special program (on request)

Part Numbers

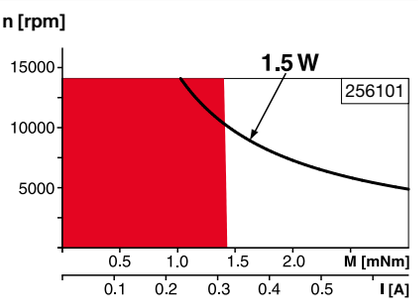
			256096	256097	256099	256100	256101	256102	256103	256104	256105
Motor Data											
	Values at nominal voltage										
1	Nominal voltage	V	2.4	2.4	4.5	4.5	6	7.2	9	10	12
2	No load speed	rpm	10400	8560	12800	10600	12400	11900	12200	12300	12500
3	No load current	mA	21.7	17	15.1	11.8	10.8	8.55	7.06	6.45	5.5
4	Nominal speed	rpm	4170	2230	6530	4210	6160	5900	6080	6250	6510
5	Nominal torque (max. continuous torque)	mNm	1.51	1.49	1.48	1.47	1.5	1.56	1.53	1.54	1.55
6	Nominal current (max. continuous current)	A	0.715	0.583	0.462	0.379	0.339	0.282	0.226	0.207	0.176
7	Stall torque	mNm	2.49	2.02	3.04	2.47	3.01	3.13	3.08	3.14	3.24
8	Stall current	A	1.15	0.771	0.919	0.619	0.66	0.549	0.444	0.412	0.36
9	Max. efficiency	%	75	73	76	75	76	77	77	77	77
	Characteristics										
10	Terminal resistance	Ω	2.08	3.11	4.9	7.27	9.09	13.1	20.3	24.3	33.3
11	Terminal inductance	mH	0.017	0.025	0.04	0.059	0.077	0.12	0.178	0.215	0.299
12	Torque constant	mNm/A	2.16	2.62	3.3	3.99	4.56	5.7	6.95	7.63	9
13	Speed constant	rpm/V	4410	3640	2890	2400	2100	1680	1370	1250	1060
14	Speed / torque gradient	rpm/mNm	4240	4330	4280	4370	4180	3860	4010	3980	3930
15	Mechanical time constant	ms	4.62	4.61	4.6	4.59	4.58	4.56	4.59	4.56	4.56
16	Rotor inertia	gcm²	0.104	0.102	0.102	0.1	0.105	0.113	0.109	0.11	0.111

Specifications

	Thermal data	
17	Thermal resistance housing-ambient	37.5 K/W
18	Thermal resistance winding-housing	9.0 K/W
19	Thermal time constant winding	2.22 s
20	Thermal time constant motor	135 s
21	Ambient temperature	-20...+65°C
22	Max. winding temperature	+85°C
	Mechanical data (sleeve bearings)	
23	Max. speed	14000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	0.15 N
27	Max. force for press fits (static)	15 N
28	Max. radial load, 4 mm from flange	0.4 N
	Other specifications	
29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	10 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 34

Planetary Gearhead
∅10 mm
0.005 - 0.1 Nm
Page 360

Planetary Gearhead
∅10 mm
0.01 - 0.15 Nm
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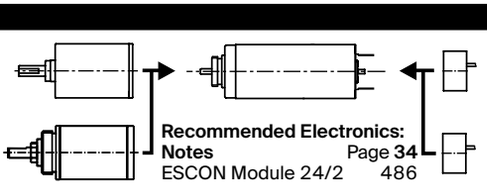


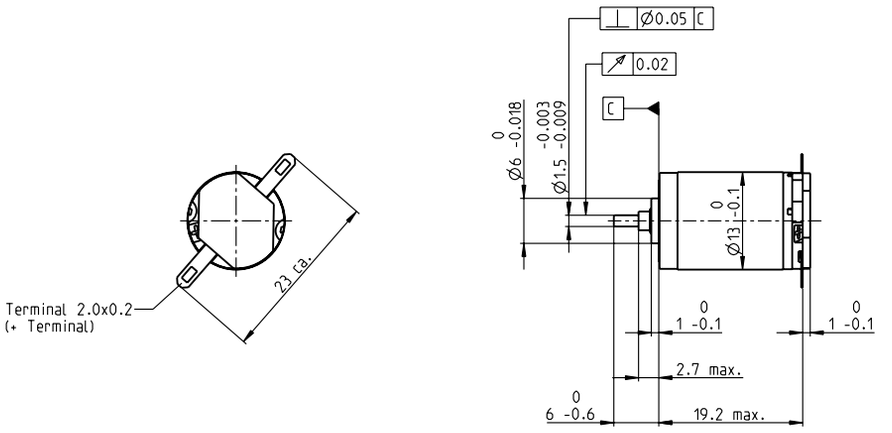
Recommended Electronics:

Notes	Page 34
ESCON Module 24/2	486
ESCON 36/2 DC	486
EPOS4 Mod./Comp. 24/1.5	496

Encoder MR
16 CPT,
2 channels
Page 457

Encoder MR
64 - 256 CPT,
2 channels
Page 458

RE 13 ∅13 mm, Precious Metal Brushes, 1.2 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

			118401	118402	118403	118404	118405	118406	118407	118408	118409	118410	118411	118412	118413	118414	118415
Motor Data																	
	Values at nominal voltage																
1	Nominal voltage	V	1	1.2	1.5	1.8	2.4	3	3.6	4.2	5	6	8	9	10	12	15
2	No load speed	rpm	11600	11300	11100	11000	11300	11600	12100	11500	11300	10900	11700	10600	11000	11200	10700
3	No load current	mA	104	84.1	65.7	53.8	42	34.5	30.6	24.5	20.1	16	13.2	10.3	9.75	8.31	6.21
4	Nominal speed	rpm	9930	8600	7670	6520	5860	6250	6960	6310	6010	5650	6400	5210	5590	5820	5300
5	Nominal torque (max. continuous torque)	mNm	0.499	0.63	0.825	1.02	1.24	1.27	1.31	1.3	1.28	1.28	1.27	1.26	1.24	1.25	1.27
6	Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.666	0.557	0.499	0.405	0.329	0.266	0.211	0.169	0.156	0.133	0.103
7	Stall torque	mNm	2.86	2.4	2.52	2.45	2.54	2.76	3.08	2.9	2.76	2.69	2.84	2.52	2.57	2.65	2.57
8	Stall current	A	3.56	2.45	2.02	1.62	1.3	1.15	1.11	0.857	0.674	0.53	0.449	0.321	0.307	0.268	0.198
9	Max. efficiency	%	69	67	68	67	68	69	70	70	69	69	69	68	68	68	68
	Characteristics																
10	Terminal resistance	Ω	0.281	0.491	0.742	1.11	1.85	2.61	3.23	4.9	7.42	11.3	17.8	28	32.6	44.9	78.8
11	Terminal inductance	mH	0.006	0.009	0.015	0.022	0.036	0.054	0.072	0.108	0.158	0.243	0.377	0.579	0.661	0.921	1.6
12	Torque constant	mNm/A	0.802	0.98	1.25	1.51	1.96	2.41	2.76	3.39	4.1	5.08	6.32	7.84	8.37	9.89	13
13	Speed constant	rpm/V	11900	9740	7660	6310	4870	3970	3460	2820	2330	1880	1510	1220	1140	966	734
14	Speed / torque gradient	rpm/mNm	4170	4880	4560	4640	4600	4310	4040	4090	4220	4190	4250	4350	4440	4380	4280
15	Mechanical time constant	ms	15.6	14.9	14.3	14.1	13.9	13.7	13.5	13.5	13.5	13.5	13.6	13.7	13.6	13.6	13.2
16	Rotor inertia	gcm²	0.358	0.291	0.299	0.29	0.288	0.303	0.318	0.315	0.306	0.308	0.304	0.3	0.293	0.297	0.294

Specifications

Thermal data

17	Thermal resistance housing-ambient	46 K/W
18	Thermal resistance winding-housing	14 K/W
19	Thermal time constant winding	5.18 s
20	Thermal time constant motor	76.1 s
21	Ambient temperature	-20...+65°C
22	Max. winding temperature	+85°C

Mechanical data (sleeve bearings)

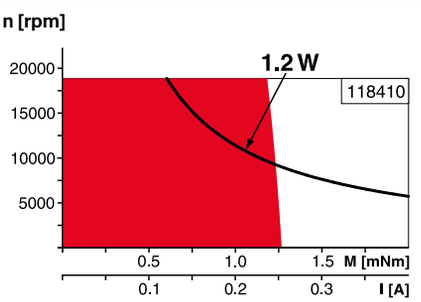
23	Max. speed	19000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.014 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static)	15 N
28	Max. radial load, 5 mm from flange	1.4 N

Other specifications

29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	12 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

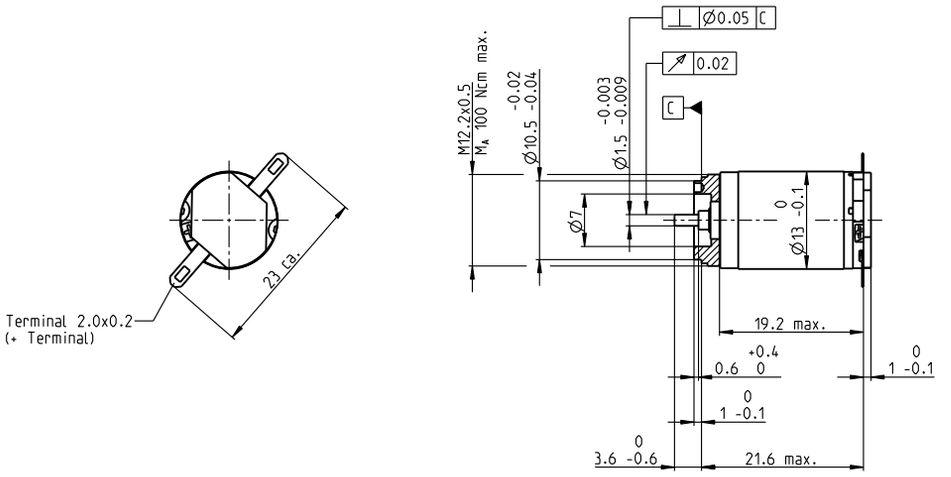
Assigned power rating

maxon Modular System Details on catalog page 34

Recommended Electronics:

Notes	Page **34**
ESCON Module 24/2	486
ESCON 36/2 DC	486

RE 13 ∅13 mm, Precious Metal Brushes, 1.2 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

	Motor Data		118416	118417	118418	118419	118420	118421	118422	118423	118424	118425	118426	118427	118428	118429	118430
	Values at nominal voltage																
1	Nominal voltage	V	1	1.2	1.5	1.8	2.4	3	3.6	4.2	5	6	8	9	10	12	15
2	No load speed	rpm	11600	11300	11100	11000	11300	11600	12100	11500	11300	10900	11700	10600	11000	11200	10700
3	No load current	mA	104	84.1	65.7	53.8	42	34.5	30.6	24.5	20.1	16	13.2	10.3	9.75	8.31	6.2
4	Nominal speed	rpm	9930	8600	7670	6520	5860	6250	6960	6310	6010	5650	6400	5210	5590	5820	5190
5	Nominal torque (max. continuous torque)	mNm	0.499	0.63	0.825	1.02	1.24	1.27	1.31	1.3	1.28	1.28	1.27	1.26	1.24	1.25	1.24
6	Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.666	0.557	0.499	0.405	0.329	0.266	0.211	0.169	0.156	0.133	0.101
7	Stall torque	mNm	2.86	2.4	2.52	2.45	2.54	2.76	3.08	2.9	2.76	2.69	2.84	2.52	2.57	2.65	2.48
8	Stall current	A	3.56	2.45	2.02	1.62	1.3	1.15	1.11	0.857	0.674	0.53	0.449	0.321	0.307	0.268	0.19
9	Max. efficiency	%	69	67	68	67	68	69	70	70	69	69	69	68	68	68	68
	Characteristics																
10	Terminal resistance	Ω	0.281	0.491	0.742	1.11	1.85	2.61	3.23	4.9	7.42	11.3	17.8	28	32.6	44.9	78.8
11	Terminal inductance	mH	0.006	0.009	0.015	0.022	0.036	0.054	0.072	0.108	0.158	0.243	0.377	0.579	0.661	0.921	1.59
12	Torque constant	mNm/A	0.802	0.98	1.25	1.51	1.96	2.41	2.76	3.39	4.1	5.08	6.32	7.84	8.37	9.89	13
13	Speed constant	rpm/V	11900	9740	7660	6310	4870	3970	3460	2820	2330	1880	1510	1220	1140	966	734
14	Speed / torque gradient	rpm/mNm	4170	4880	4560	4640	4600	4310	4040	4090	4220	4190	4250	4350	4440	4380	4450
15	Mechanical time constant	ms	15.6	14.9	14.3	14.1	13.9	13.7	13.5	13.5	13.5	13.5	13.6	13.7	13.6	13.6	13.7
16	Rotor inertia	gcm²	0.358	0.291	0.299	0.29	0.288	0.303	0.318	0.315	0.306	0.308	0.304	0.3	0.293	0.297	0.294

Specifications

Thermal data

17	Thermal resistance housing-ambient	46 K/W
18	Thermal resistance winding-housing	14 K/W
19	Thermal time constant winding	5.18 s
20	Thermal time constant motor	76.1 s
21	Ambient temperature	-20...+65°C
22	Max. winding temperature	+85°C

Mechanical data (sleeve bearings)

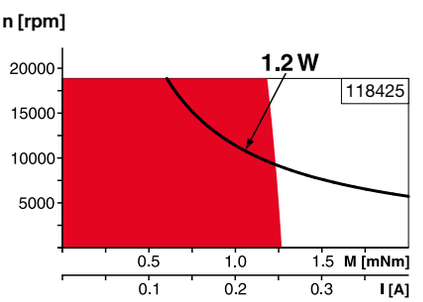
23	Max. speed	19 000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.014 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static)	15 N
28	Max. radial load, 5 mm from flange	1.4 N

Other specifications

29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	15 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

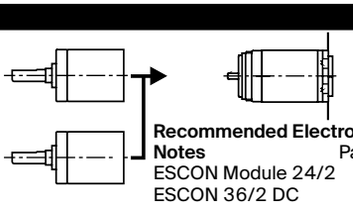
Assigned power rating

maxon Modular System

Details on catalog page 34

Planetary Gearhead
∅13 mm
0.05 - 0.15 Nm
Page 363

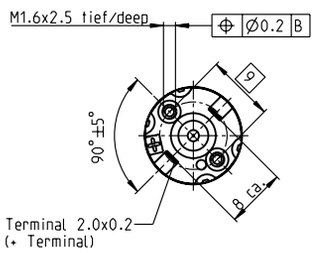
Planetary Gearhead
∅13 mm
0.2 - 0.35 Nm
Page 364

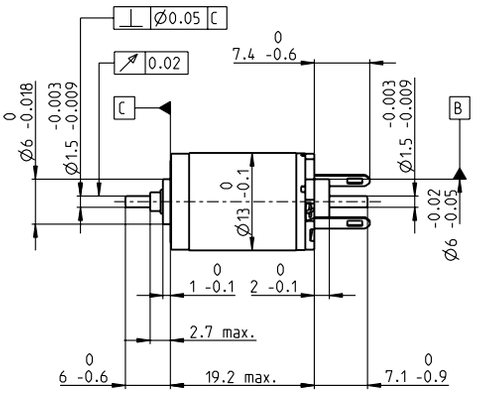


Recommended Electronics:

Notes	Page **34**
ESCON Module 24/2	486
ESCON 36/2 DC	486

RE 13 ∅13 mm, Precious Metal Brushes, 0.75 Watt





M 1:1

Stock program
Standard program
Special program (on request)

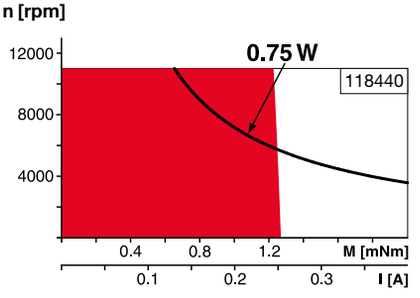
			Part Numbers														
			118431	118432	118433	118434	118435	118436	118437	118438	118439	118440	118441	118442	118443	118444	118445
Motor Data																	
	Values at nominal voltage																
1	Nominal voltage	V	0.6	0.72	0.9	1.2	1.5	1.8	1.8	2.4	3	3.6	4.8	6	6	7.2	10
2	No load speed	rpm	6900	6710	6590	7250	6990	6850	5950	6490	6700	6480	6950	7000	6530	6650	7030
3	No load current	mA	88.2	71.7	56.1	47.3	36.2	29.4	24.7	20.6	17.1	13.7	11.2	9.06	8.33	7.09	5.46
4	Nominal speed	rpm	5170	3920	3070	2740	1430	1430	682	1350	1300	1090	1520	1510	990	1140	1480
5	Nominal torque (max. continuous torque)	mNm	0.511	0.643	0.837	1.03	1.26	1.3	1.34	1.28	1.3	1.3	1.29	1.28	1.26	1.27	1.26
6	Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.671	0.562	0.504	0.396	0.331	0.268	0.213	0.17	0.158	0.134	0.101
7	Stall torque	mNm	1.71	1.44	1.51	1.63	1.59	1.66	1.54	1.66	1.66	1.61	1.7	1.68	1.54	1.59	1.65
8	Stall current	A	2.14	1.47	1.21	1.08	0.812	0.69	0.557	0.489	0.404	0.318	0.269	0.214	0.184	0.161	0.127
9	Max. efficiency	%	64	61	62	63	63	63	63	64	64	63	64	64	62	63	63
	Characteristics																
10	Terminal resistance	Ω	0.281	0.491	0.742	1.11	1.85	2.61	3.23	4.9	7.42	11.3	17.8	28	32.6	44.9	78.8
11	Terminal inductance	mH	0.006	0.009	0.015	0.022	0.036	0.054	0.072	0.108	0.158	0.243	0.377	0.579	0.661	0.921	1.59
12	Torque constant	mNm/A	0.802	0.98	1.25	1.51	1.96	2.41	2.76	3.39	4.1	5.08	6.32	7.84	8.37	9.89	13
13	Speed constant	rpm/V	11900	9740	7660	6310	4870	3970	3460	2820	2330	1880	1510	1220	1140	966	734
14	Speed / torque gradient	rpm/mNm	4170	4880	4560	4640	4600	4310	4040	4090	4220	4190	4250	4350	4440	4380	4450
15	Mechanical time constant	ms	15.6	14.9	14.3	14.1	13.9	13.7	13.5	13.5	13.5	13.5	13.6	13.7	13.6	13.6	13.7
16	Rotor inertia	gcm²	0.358	0.291	0.299	0.29	0.288	0.303	0.318	0.315	0.306	0.308	0.304	0.3	0.293	0.297	0.294

Specifications

	Thermal data	
17	Thermal resistance housing-ambient	46 K/W
18	Thermal resistance winding-housing	14 K/W
19	Thermal time constant winding	5.18 s
20	Thermal time constant motor	76.1 s
21	Ambient temperature	-20...+65°C
22	Max. winding temperature	+85°C
	Mechanical data (sleeve bearings)	
23	Max. speed	11000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.014 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static)	15 N
	(static, shaft supported)	170 N
28	Max. radial load, 5 mm from flange	1.4 N
	Other specifications	
29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	12 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Operating Range



Comments

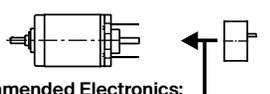
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 34



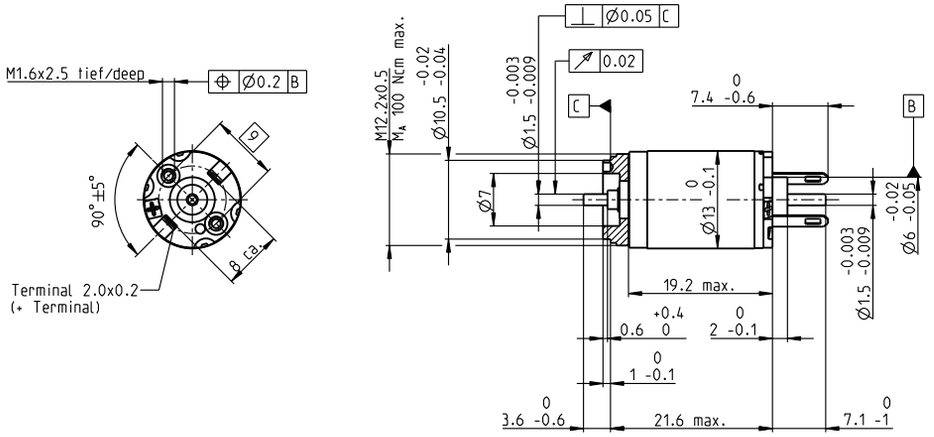
Recommended Electronics:

Notes	Page 34
ESCON Module 24/2	486
ESCON 36/2 DC	486
EPOS4 Mod./Comp. 24/1.5	496

Encoder MR
16 CPT,
2 channels
Page 457

Encoder MR
64 - 256 CPT,
2 channels
Page 458/459

RE 13 ∅13 mm, Precious Metal Brushes, 0.75 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

	Motor Data		118446	118447	118448	118449	118450	118451	118452	118453	118454	118455	118456	118457	118458	118459	118460
	Values at nominal voltage																
1	Nominal voltage	V	0.6	0.7	0.9	1.2	1.5	1.8	1.8	2.4	3	3.6	4.8	6	6	7.2	10
2	No load speed	rpm	6900	6520	6590	7250	6990	6850	5950	6490	6700	6480	6950	7000	6530	6650	7030
3	No load current	mA	88.2	71.2	56.1	47.3	36.2	29.4	24.7	20.6	17.1	13.7	11.2	9.06	8.33	7.09	5.46
4	Nominal speed	rpm	5170	3730	3070	2740	1430	1430	682	1350	1300	1090	1520	1510	990	1140	1480
5	Nominal torque (max. continuous torque)	mNm	0.511	0.643	0.837	1.03	1.26	1.3	1.34	1.28	1.3	1.3	1.29	1.28	1.26	1.27	1.26
6	Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.671	0.562	0.504	0.396	0.331	0.268	0.213	0.17	0.158	0.134	0.101
7	Stall torque	mNm	1.71	1.4	1.51	1.63	1.59	1.66	1.54	1.66	1.66	1.61	1.7	1.68	1.54	1.59	1.65
8	Stall current	A	2.14	1.43	1.21	1.08	0.812	0.69	0.557	0.489	0.404	0.318	0.269	0.214	0.184	0.161	0.127
9	Max. efficiency	%	64	61	62	63	63	63	63	64	64	63	64	64	62	63	63
	Characteristics																
10	Terminal resistance	Ω	0.281	0.491	0.742	1.11	1.85	2.61	3.23	4.9	7.42	11.3	17.8	28	32.6	44.9	78.8
11	Terminal inductance	mH	0.006	0.009	0.015	0.022	0.036	0.054	0.072	0.108	0.158	0.243	0.377	0.579	0.661	0.921	1.59
12	Torque constant	mNm/A	0.802	0.98	1.25	1.51	1.96	2.41	2.76	3.39	4.1	5.08	6.32	7.84	8.37	9.89	13
13	Speed constant	rpm/V	11900	9740	7660	6310	4870	3970	3460	2820	2330	1880	1510	1220	1140	966	734
14	Speed / torque gradient	rpm/mNm	4170	4880	4560	4640	4600	4310	4040	4090	4220	4190	4250	4350	4440	4380	4450
15	Mechanical time constant	ms	15.6	14.9	14.3	14.1	13.9	13.7	13.5	13.5	13.5	13.5	13.6	13.7	13.6	13.6	13.7
16	Rotor inertia	gcm²	0.358	0.291	0.299	0.29	0.288	0.303	0.318	0.315	0.306	0.308	0.304	0.3	0.293	0.297	0.294

Specifications

Thermal data

17	Thermal resistance housing-ambient	46 K/W
18	Thermal resistance winding-housing	14 K/W
19	Thermal time constant winding	5.18 s
20	Thermal time constant motor	76.1 s
21	Ambient temperature	-20...+65°C
22	Max. winding temperature	+85°C

Mechanical data (sleeve bearings)

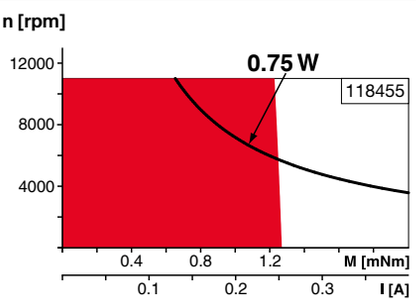
23	Max. speed	11000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.014 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static)	15 N
	(static, shaft supported)	170 N
28	Max. radial load, 5 mm from flange	1.4 N

Other specifications

29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	15 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

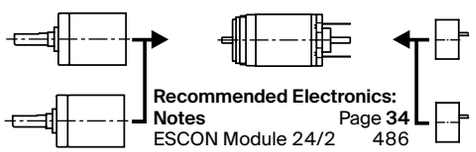
Assigned power rating

maxon Modular System

Details on catalog page 34

Planetary Gearhead
∅13 mm
0.05 - 0.15 Nm
Page 363

Planetary Gearhead
∅13 mm
0.2 - 0.35 Nm
Page 364



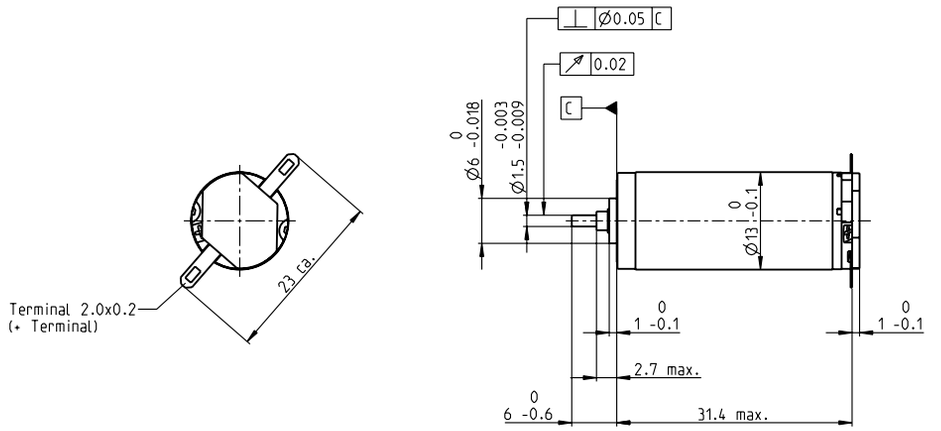
Recommended Electronics:

Notes	Page **34**
ESCON Module 24/2	486
ESCON 36/2 DC	486
EPOS4 Mod./Comp. 24/1.5	496

Encoder MR
16 CPT,
2 channels
Page 457

Encoder MR
64 - 256 CPT,
2 channels
Page 458/459

RE 13 ∅13 mm, Precious Metal Brushes, 2.5 Watt



M 1:1

Stock program
Standard program
Special program (on request)

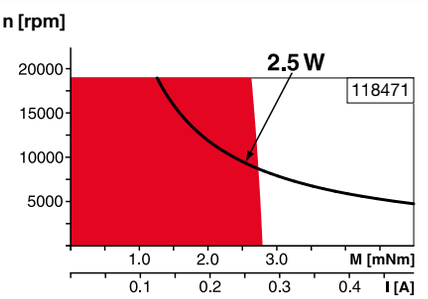
			Part Numbers														
			118461	118462	118463	118464	118465	118466	118467	118468	118469	118470	118471	118472	118473	118474	118475
Motor Data																	
	Values at nominal voltage																
1	Nominal voltage	V	2.4	3	3	3.6	4.8	4.8	6	7.2	8	10	12	15	15	18	24
2	No load speed	rpm	10600	12200	10700	10800	11400	10100	11400	11400	10900	11400	11000	11100	10300	10600	11500
3	No load current	mA	51.5	50.8	42	35.5	28.8	24.4	23	19.2	16.1	13.8	11	8.87	7.98	6.9	5.82
4	Nominal speed	rpm	9160	10500	8490	8050	7890	6430	7660	7730	7320	7790	7390	7470	6620	6920	7800
5	Nominal torque (max. continuous torque)	mNm	1.44	1.56	1.8	2.16	2.76	2.87	2.81	2.86	2.98	2.9	2.89	2.9	2.88	2.9	2.84
6	Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.72	0.664	0.586	0.497	0.443	0.363	0.291	0.235	0.217	0.187	0.149
7	Stall torque	mNm	9.95	10.2	8.34	8.25	8.81	7.78	8.51	8.84	9.1	9.15	8.77	8.9	8.13	8.44	8.87
8	Stall current	A	4.63	4.42	3.15	2.63	2.22	1.74	1.72	1.48	1.31	1.11	0.856	0.699	0.592	0.526	0.451
9	Max. efficiency	%	80	80	79	78	79	78	79	79	79	79	79	79	78	79	79
	Characteristics																
10	Terminal resistance	Ω	0.519	0.679	0.951	1.37	2.16	2.75	3.5	4.85	6.11	9.03	14	21.5	25.3	34.2	53.2
11	Terminal inductance	mH	0.021	0.025	0.032	0.046	0.073	0.092	0.114	0.164	0.223	0.316	0.485	0.749	0.87	1.19	1.79
12	Torque constant	mNm/A	2.15	2.31	2.65	3.14	3.97	4.46	4.96	5.95	6.94	8.27	10.2	12.7	13.7	16	19.7
13	Speed constant	rpm/V	4440	4130	3610	3040	2410	2140	1930	1600	1380	1160	932	750	696	595	485
14	Speed / torque gradient	rpm/mNm	1070	1210	1300	1330	1310	1320	1360	1310	1210	1260	1270	1260	1280	1270	1310
15	Mechanical time constant	ms	7.65	7.55	7.45	7.37	7.28	7.27	7.28	7.23	7.16	7.2	7.21	7.21	7.21	7.22	7.27
16	Rotor inertia	gcm²	0.681	0.596	0.548	0.53	0.53	0.526	0.512	0.528	0.565	0.545	0.541	0.544	0.536	0.543	0.529

Specifications

	Thermal data	
17	Thermal resistance housing-ambient	33 K/W
18	Thermal resistance winding-housing	7.0 K/W
19	Thermal time constant winding	4.88 s
20	Thermal time constant motor	229 s
21	Ambient temperature	-20...+65°C
22	Max. winding temperature	+85°C
	Mechanical data (sleeve bearings)	
23	Max. speed	19 000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.014 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static)	15 N
28	Max. radial load, 5 mm from flange	1.4 N
	Other specifications	
29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	21 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

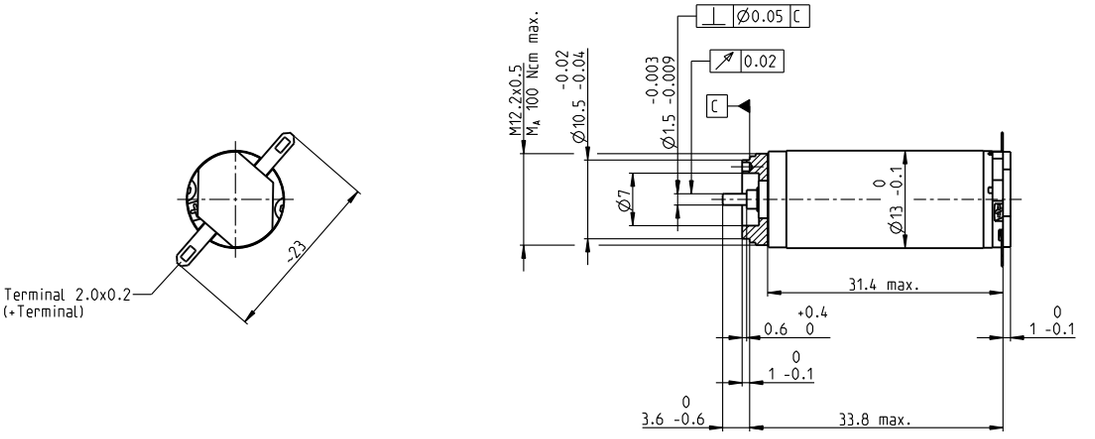
Assigned power rating

maxon Modular System Details on catalog page 34

Recommended Electronics:

Notes	Page **34**
ESCON Module 24/2	486
ESCON 36/2 DC	486
ESCON Module 50/5	487
ESCON 50/5	489

RE 13 ∅13 mm, Precious Metal Brushes, 2.5 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

	Motor Data		118476	118477	118478	118479	118480	118481	118482	118483	118484	118485	118486	118487	118488	118489	118490
	Values at nominal voltage																
1	Nominal voltage	V	2.4	3	3	3.6	4.8	4.8	6	7.2	8	10	12	15	15	18	24
2	No load speed	rpm	10600	12200	10700	10800	11400	10100	11400	11400	10900	11400	11000	11100	10300	10600	11500
3	No load current	mA	51.5	50.8	42	35.5	28.8	24.4	23	19.2	16.1	13.8	11	8.87	7.98	6.9	5.82
4	Nominal speed	rpm	9160	10500	8490	8050	7890	6430	7660	7730	7320	7790	7390	7470	6620	6920	7800
5	Nominal torque (max. continuous torque)	mNm	1.44	1.56	1.8	2.16	2.76	2.87	2.81	2.86	2.98	2.9	2.89	2.9	2.88	2.9	2.84
6	Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.72	0.664	0.586	0.497	0.443	0.363	0.291	0.235	0.217	0.187	0.149
7	Stall torque	mNm	9.95	10.2	8.34	8.25	8.81	7.78	8.51	8.84	9.1	9.15	8.77	8.9	8.13	8.44	8.87
8	Stall current	A	4.63	4.42	3.15	2.63	2.22	1.74	1.72	1.48	1.31	1.11	0.856	0.699	0.592	0.526	0.451
9	Max. efficiency	%	80	80	79	78	79	78	79	79	79	79	79	79	78	79	79
	Characteristics																
10	Terminal resistance	Ω	0.519	0.679	0.951	1.37	2.16	2.75	3.5	4.85	6.11	9.03	14	21.5	25.3	34.2	53.2
11	Terminal inductance	mH	0.021	0.025	0.032	0.046	0.073	0.092	0.114	0.164	0.223	0.316	0.486	0.75	0.871	1.19	1.79
12	Torque constant	mNm/A	2.15	2.31	2.65	3.14	3.97	4.46	4.96	5.95	6.94	8.27	10.2	12.7	13.7	16	19.7
13	Speed constant	rpm/V	4440	4130	3610	3040	2410	2140	1930	1600	1380	1160	932	750	696	595	485
14	Speed / torque gradient	rpm/mNm	1070	1210	1300	1330	1310	1320	1360	1310	1210	1260	1270	1260	1280	1270	1310
15	Mechanical time constant	ms	7.65	7.55	7.45	7.37	7.28	7.27	7.28	7.23	7.16	7.2	7.21	7.21	7.21	7.22	7.27
16	Rotor inertia	gcm²	0.681	0.596	0.548	0.53	0.53	0.526	0.512	0.528	0.565	0.545	0.541	0.544	0.536	0.543	0.529

Specifications

Thermal data

17	Thermal resistance housing-ambient	33 K/W
18	Thermal resistance winding-housing	7.0 K/W
19	Thermal time constant winding	4.88 s
20	Thermal time constant motor	229 s
21	Ambient temperature	-20...+65°C
22	Max. winding temperature	+85°C

Mechanical data (sleeve bearings)

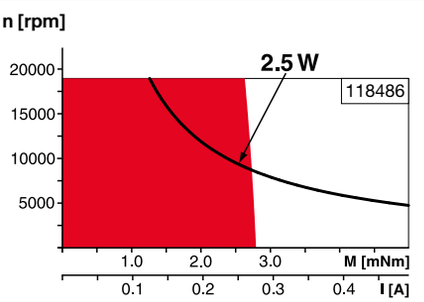
23	Max. speed	19 000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.014 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static)	15 N
28	Max. radial load, 5 mm from flange	1.4 N

Other specifications

29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	24 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

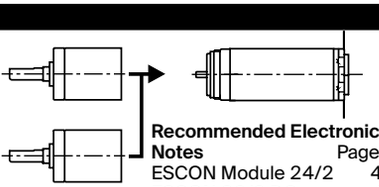
Assigned power rating

maxon Modular System

Details on catalog page 34

Planetary Gearhead
∅13 mm
0.05 - 0.15 Nm
Page 363

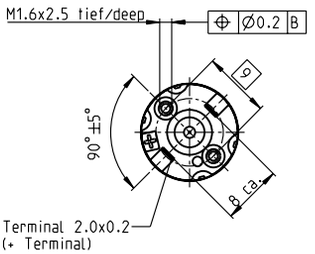
Planetary Gearhead
∅13 mm
0.2 - 0.35 Nm
Page 364

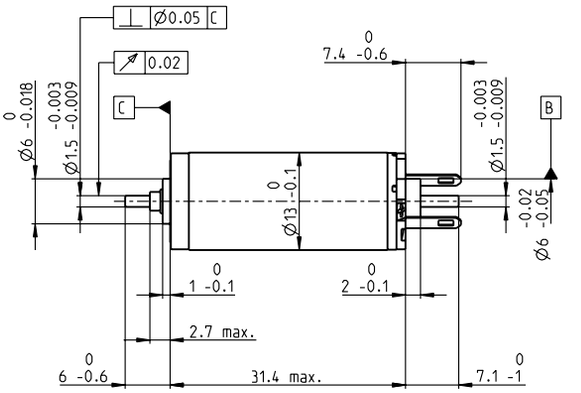


Recommended Electronics:

Notes	Page **34**
ESCON Module 24/2	486
ESCON 36/2 DC	486
ESCON Module 50/5	487
ESCON 50/5	489

RE 13 ∅13 mm, Precious Metal Brushes, 2 Watt





M 1:1

Stock program
Standard program
Special program (on request)

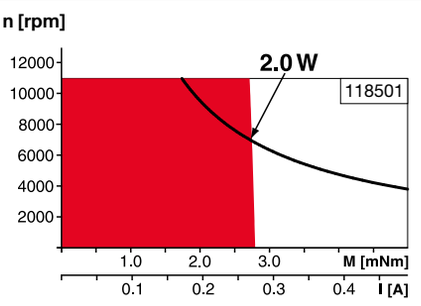
			Part Numbers														
			118491	118492	118493	118494	118495	118496	118497	118498	118499	118500	118501	118502	118503	118504	118505
Motor Data																	
	Values at nominal voltage																
1	Nominal voltage	V	1.5	1.5	1.8	2.4	3	3	3.6	4.2	4.8	6	7.2	9	10	12	15
2	No load speed	rpm	6570	6090	6380	7170	7100	6300	6800	6620	6490	6810	6590	6630	6840	7020	7150
3	No load current	mA	43.8	39.8	35.3	30.8	24.3	20.8	19.2	15.8	13.5	11.5	9.19	7.41	6.94	5.99	4.91
4	Nominal speed	rpm	5170	4320	4160	4400	3560	2550	3000	2880	2880	3130	2880	2940	3120	3330	3400
5	Nominal torque (max. continuous torque)	mNm	1.46	1.58	1.82	2.18	2.78	2.91	2.85	2.91	3.02	2.95	2.93	2.94	2.92	2.93	2.88
6	Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.72	0.669	0.592	0.502	0.446	0.367	0.294	0.237	0.218	0.188	0.151
7	Stall torque	mNm	6.22	5.12	5.01	5.5	5.51	4.86	5.1	5.16	5.46	5.49	5.26	5.34	5.42	5.63	5.54
8	Stall current	A	2.89	2.21	1.89	1.75	1.39	1.09	1.03	0.866	0.786	0.665	0.514	0.419	0.395	0.351	0.282
9	Max. efficiency	%	77	75	75	76	76	75	75	75	76	76	75	76	76	76	76
	Characteristics																
10	Terminal resistance	Ω	0.519	0.679	0.951	1.37	2.16	2.75	3.5	4.85	6.11	9.03	14	21.5	25.3	34.2	53.2
11	Terminal inductance	mH	0.021	0.025	0.032	0.046	0.073	0.092	0.114	0.164	0.223	0.316	0.485	0.749	0.87	1.19	1.79
12	Torque constant	mNm/A	2.15	2.31	2.65	3.14	3.97	4.46	4.96	5.95	6.94	8.27	10.2	12.7	13.7	16	19.7
13	Speed constant	rpm/V	4440	4130	3610	3040	2410	2140	1930	1600	1380	1160	932	750	696	595	485
14	Speed / torque gradient	rpm/mNm	1070	1210	1300	1330	1310	1320	1360	1310	1210	1260	1270	1260	1280	1270	1310
15	Mechanical time constant	ms	7.65	7.55	7.45	7.37	7.28	7.27	7.28	7.23	7.16	7.2	7.21	7.21	7.21	7.22	7.27
16	Rotor inertia	gcm²	0.681	0.596	0.548	0.53	0.53	0.526	0.512	0.528	0.565	0.545	0.541	0.544	0.536	0.543	0.529

Specifications

	Thermal data	
17	Thermal resistance housing-ambient	33 K/W
18	Thermal resistance winding-housing	7.0 K/W
19	Thermal time constant winding	4.88 s
20	Thermal time constant motor	229 s
21	Ambient temperature	-20...+65°C
22	Max. winding temperature	+85°C
	Mechanical data (sleeve bearings)	
23	Max. speed	11000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.014 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static)	15 N
	(static, shaft supported)	95 N
28	Max. radial load, 5 mm from flange	1.4 N
	Other specifications	
29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	21 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Operating Range



Comments

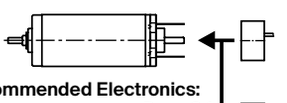
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 34



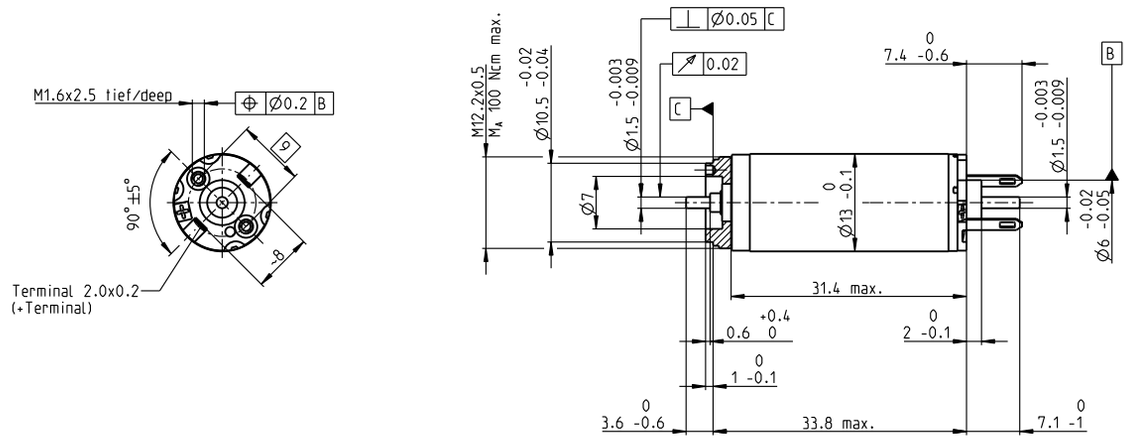
Recommended Electronics:

Notes		Page **34**
ESCON Module 24/2		486
ESCON 36/2 DC		486
EPOS4 Mod./Comp. 24/1.5		496

Encoder MR
16 CPT,
2 channels
Page 457

Encoder MR
64 - 256 CPT,
2 channels
Page 458/459

RE 13 ∅13 mm, Precious Metal Brushes, 2 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

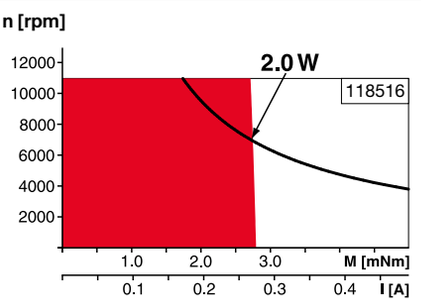
	Motor Data		118506	118507	118508	118509	118510	118511	118512	118513	118514	118515	118516	118517	118518	118519	118520
	Values at nominal voltage																
1	Nominal voltage	V	1.5	1.5	1.8	2.4	3	3	3.6	4.2	4.8	6	7.2	9	10	12	15
2	No load speed	rpm	6570	6090	6380	7170	7100	6300	6800	6620	6490	6810	6590	6630	6840	7020	7150
3	No load current	mA	43.8	39.8	35.3	30.8	24.3	20.8	19.2	15.8	13.5	11.5	9.19	7.41	6.94	5.99	4.91
4	Nominal speed	rpm	5170	4320	4160	4400	3560	2550	3000	2880	2880	3130	2880	2940	3120	3330	3400
5	Nominal torque (max. continuous torque)	mNm	1.46	1.58	1.82	2.18	2.78	2.91	2.85	2.91	3.02	2.95	2.93	2.94	2.92	2.93	2.88
6	Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.72	0.669	0.592	0.502	0.446	0.367	0.294	0.237	0.218	0.188	0.151
7	Stall torque	mNm	6.22	5.12	5.01	5.5	5.51	4.86	5.1	5.16	5.46	5.49	5.26	5.34	5.42	5.63	5.54
8	Stall current	A	2.89	2.21	1.89	1.75	1.39	1.09	1.03	0.866	0.786	0.665	0.514	0.419	0.395	0.351	0.282
9	Max. efficiency	%	77	75	75	76	76	75	75	75	76	76	75	76	76	76	76
	Characteristics																
10	Terminal resistance	Ω	0.519	0.679	0.951	1.37	2.16	2.75	3.5	4.85	6.11	9.03	14	21.5	25.3	34.2	53.2
11	Terminal inductance	mH	0.021	0.025	0.032	0.046	0.073	0.092	0.114	0.164	0.223	0.316	0.486	0.75	0.871	1.19	1.79
12	Torque constant	mNm/A	2.15	2.31	2.65	3.14	3.97	4.46	4.96	5.95	6.94	8.27	10.2	12.7	13.7	16	19.7
13	Speed constant	rpm/V	4440	4130	3610	3040	2410	2140	1930	1600	1380	1160	932	750	696	595	485
14	Speed / torque gradient	rpm/mNm	1070	1210	1300	1330	1310	1320	1360	1310	1210	1260	1270	1260	1280	1270	1310
15	Mechanical time constant	ms	7.65	7.55	7.45	7.37	7.28	7.27	7.28	7.23	7.16	7.2	7.21	7.21	7.21	7.22	7.27
16	Rotor inertia	gcm²	0.681	0.596	0.548	0.53	0.53	0.526	0.512	0.528	0.565	0.545	0.541	0.544	0.536	0.543	0.529

Specifications

	Thermal data	
17	Thermal resistance housing-ambient	33 K/W
18	Thermal resistance winding-housing	7.0 K/W
19	Thermal time constant winding	4.88 s
20	Thermal time constant motor	229 s
21	Ambient temperature	-20...+65°C
22	Max. winding temperature	+85°C
	Mechanical data (sleeve bearings)	
23	Max. speed	11000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.014 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static)	15 N
	(static, shaft supported)	95 N
28	Max. radial load, 5 mm from flange	1.4 N
	Other specifications	
29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	24 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

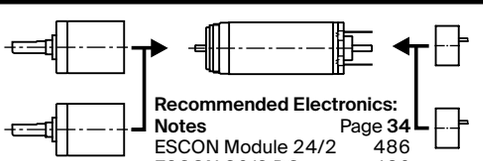
Assigned power rating

maxon Modular System

Details on catalog page 34

Planetary Gearhead
∅13 mm
0.05 - 0.15 Nm
Page 363

Planetary Gearhead
∅13 mm
0.2 - 0.35 Nm
Page 364



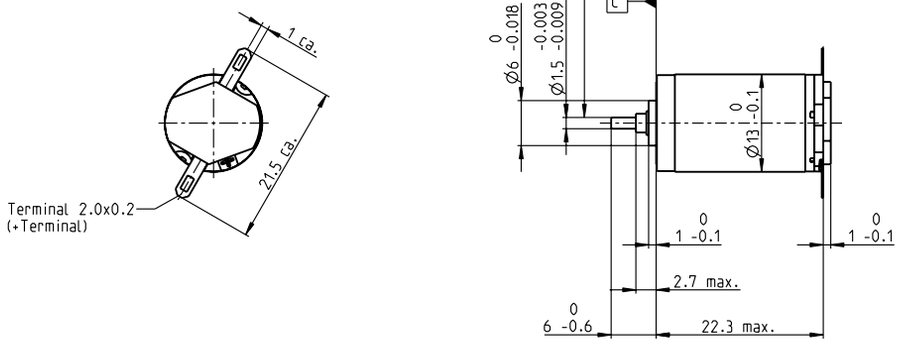
Recommended Electronics:

Notes	Page 34
ESCON Module 24/2	486
ESCON 36/2 DC	486
EPOS4 Mod./Comp. 24/1.5	496

Encoder MR
16 CPT,
2 channels
Page 457

Encoder MR
64 - 256 CPT,
2 channels
Page 458/459

RE 13 ∅13 mm, Graphite Brushes, 1.5 Watt



M 1:1

Stock program
Standard program
Special program (on request)

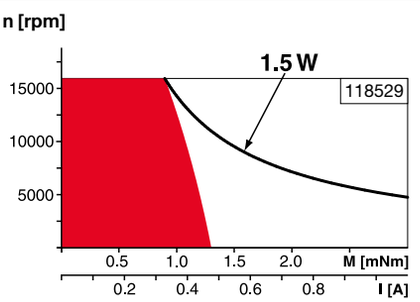
Motor Data		Part Numbers														
		118521	118522	118523	118524	118525	118526	118527	118528	118529	118530	118531	118532	118533	118534	118535
	Values at nominal voltage															
1	Nominal voltage	V	1.2	1.5	2.4	3	3.6	4.2	4.8	6	7.2	9	12	12	15	18	20
2	No load speed	rpm	13300	13300	13700	13200	13000	13300	12300	12700	12300	12300	13300	12300	13100	14000	13300
3	No load current	mA	482	394	259	197	159	140	111	92.5	73.7	59.2	49.2	44.7	38.9	35.1	29.7
4	Nominal speed	rpm	12600	11800	10600	8520	7790	8260	7130	7480	7010	7000	8040	6940	7870	8890	8020
5	Nominal torque (max. continuous torque)	mNm	0.194	0.329	0.719	1.06	1.23	1.27	1.28	1.25	1.26	1.25	1.21	1.22	1.21	1.2	1.19
6	Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.659	0.588	0.481	0.39	0.316	0.252	0.199	0.186	0.157	0.139	0.119
7	Stall torque	mNm	4.07	3.25	3.33	3.19	3.3	3.56	3.26	3.25	3.16	3.12	3.28	3.01	3.23	3.51	3.22
8	Stall current	A	5.2	3.4	2.26	1.67	1.41	1.32	0.989	0.814	0.639	0.506	0.429	0.368	0.335	0.321	0.254
9	Max. efficiency	%	49	44	45	44	45	46	45	45	44	44	45	43	44	46	44
	Characteristics																
10	Terminal resistance	Ω	0.231	0.441	1.06	1.8	2.56	3.18	4.85	7.37	11.3	17.8	28	32.6	44.8	56.1	78.8
11	Terminal inductance	mH	0.006	0.009	0.022	0.036	0.054	0.072	0.108	0.158	0.243	0.377	0.579	0.661	0.921	1.19	1.59
12	Torque constant	mNm/A	0.782	0.956	1.48	1.91	2.35	2.69	3.3	4	4.95	6.17	7.64	8.17	9.64	10.9	12.7
13	Speed constant	rpm/V	12200	9990	6470	5000	4070	3550	2890	2390	1930	1550	1250	1170	990	872	753
14	Speed / torque gradient	rpm/mNm	3600	4610	4660	4700	4440	4190	4250	4410	4390	4460	4570	4660	4600	4470	4680
15	Mechanical time constant	ms	13.5	14	14.1	14.2	14.1	14	14	14.1	14.2	14.2	14.3	14.3	14.3	14.2	14.4
16	Rotor inertia	gcm²	0.358	0.291	0.29	0.288	0.303	0.318	0.315	0.306	0.308	0.304	0.3	0.293	0.297	0.303	0.294

Specifications

	Thermal data	
17	Thermal resistance housing-ambient	46 K/W
18	Thermal resistance winding-housing	14 K/W
19	Thermal time constant winding	5.18 s
20	Thermal time constant motor	231 s
21	Ambient temperature	-20...+85°C
22	Max. winding temperature	+125°C
	Mechanical data (sleeve bearings)	
23	Max. speed	16 000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.014 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static)	15 N
28	Max. radial load, 5 mm from flange	1.4 N
	Other specifications	
29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	15 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

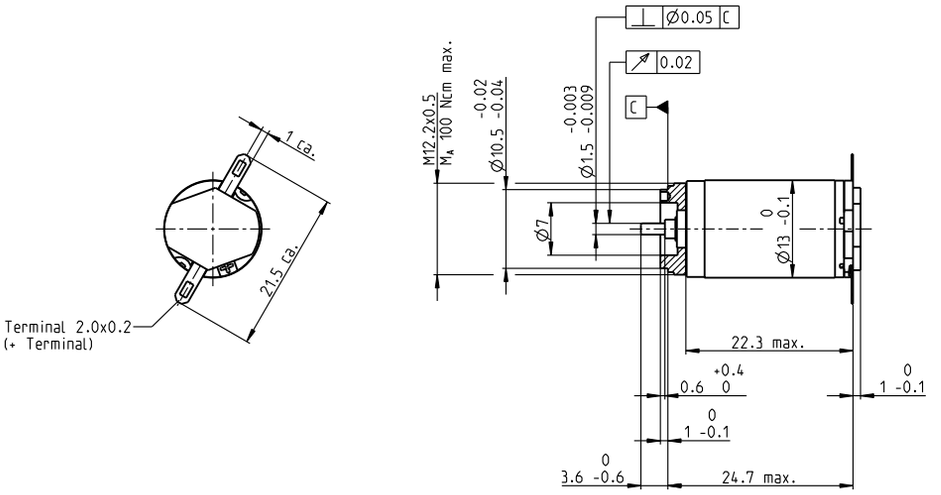
Assigned power rating

maxon Modular System Details on catalog page 34

Recommended Electronics:

Notes	Page **34**
ESCON Module 24/2	486
ESCON 36/2 DC	486

RE 13 ∅13 mm, Graphite Brushes, 1.5 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

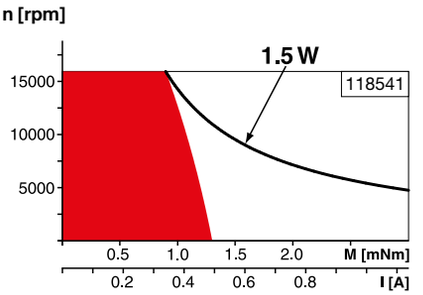
			118536	118537	118538	118539	118540	118541	118542	118543	118544	118545	118546	118547	118548	118549	118550
Motor Data																	
	Values at nominal voltage																
1	Nominal voltage	V	1.2	1.5	2.4	3	3.6	4.2	4.8	6	7.2	9	12	12	15	18	20
2	No load speed	rpm	13300	13300	13700	13200	13000	13300	12300	12700	12300	12300	13300	12300	13100	14000	13300
3	No load current	mA	482	394	259	197	159	140	111	92.5	73.7	59.2	49.2	44.7	38.9	35.1	29.7
4	Nominal speed	rpm	12600	11800	10600	8520	7790	8260	7130	7480	7010	7000	8040	6940	7870	8890	8020
5	Nominal torque (max. continuous torque)	mNm	0.194	0.329	0.719	1.06	1.23	1.27	1.28	1.25	1.26	1.25	1.21	1.22	1.21	1.2	1.19
6	Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.659	0.588	0.481	0.39	0.316	0.252	0.199	0.186	0.157	0.139	0.119
7	Stall torque	mNm	4.07	3.25	3.33	3.19	3.3	3.56	3.26	3.25	3.16	3.12	3.28	3.01	3.23	3.51	3.22
8	Stall current	A	5.2	3.4	2.26	1.67	1.41	1.32	0.989	0.814	0.639	0.506	0.429	0.368	0.335	0.321	0.254
9	Max. efficiency	%	49	44	45	44	45	46	45	45	44	44	45	43	44	46	44
	Characteristics																
10	Terminal resistance	Ω	0.231	0.441	1.06	1.8	2.56	3.18	4.85	7.37	11.3	17.8	28	32.6	44.8	56.1	78.8
11	Terminal inductance	mH	0.006	0.009	0.022	0.036	0.054	0.072	0.108	0.158	0.243	0.377	0.579	0.661	0.921	1.19	1.59
12	Torque constant	mNm/A	0.782	0.956	1.48	1.91	2.35	2.69	3.3	4	4.95	6.17	7.64	8.17	9.64	10.9	12.7
13	Speed constant	rpm/V	12200	9990	6470	5000	4070	3550	2890	2390	1930	1550	1250	1170	990	872	753
14	Speed / torque gradient	rpm/mNm	3600	4610	4660	4700	4440	4190	4250	4410	4390	4460	4570	4660	4600	4470	4680
15	Mechanical time constant	ms	13.5	14	14.1	14.2	14.1	14	14	14.1	14.2	14.2	14.3	14.3	14.3	14.2	14.4
16	Rotor inertia	gcm²	0.358	0.291	0.29	0.288	0.303	0.318	0.315	0.306	0.308	0.304	0.3	0.293	0.297	0.303	0.294

Specifications

	Thermal data	
17	Thermal resistance housing-ambient	46 K/W
18	Thermal resistance winding-housing	14 K/W
19	Thermal time constant winding	5.38 s
20	Thermal time constant motor	231 s
21	Ambient temperature	-20...+85°C
22	Max. winding temperature	+125°C
	Mechanical data (sleeve bearings)	
23	Max. speed	16 000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.014 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static)	15 N
28	Max. radial load, 5 mm from flange	1.4 N
	Other specifications	
29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	17 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

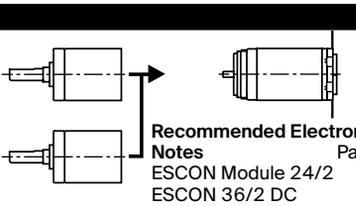
Assigned power rating

maxon Modular System

Details on catalog page 34

Planetary Gearhead
∅13 mm
0.05 - 0.15 Nm
Page 363

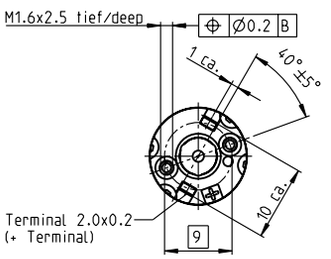
Planetary Gearhead
∅13 mm
0.2 - 0.35 Nm
Page 364

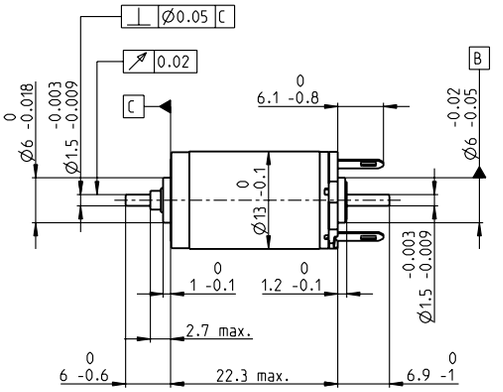


Recommended Electronics:

Notes	Page **34**
ESCON Module 24/2	486
ESCON 36/2 DC	486

RE 13 ∅13 mm, Graphite Brushes, 1.5 Watt





M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers	118555	118556	118557	118558	118559	118560	118561	118562	118563	118564	118565	118566
Motor Data												
Values at nominal voltage												
1 Nominal voltage	V	3	3.6	4.2	4.8	6	7.2	9	12	12	15	18	20
2 No load speed	rpm	13200	13000	13300	12300	12700	12300	12300	13300	12300	13100	14000	13300
3 No load current	mA	197	159	140	111	92.5	73.7	59.2	49.2	44.7	38.9	35.1	29.7
4 Nominal speed	rpm	8520	7790	8260	7130	7480	7010	7000	8040	6940	7870	8890	8020
5 Nominal torque (max. continuous torque)	mNm	1.06	1.23	1.27	1.28	1.25	1.26	1.25	1.21	1.22	1.21	1.2	1.19
6 Nominal current (max. continuous current)	A	0.72	0.659	0.588	0.481	0.39	0.316	0.252	0.199	0.186	0.157	0.139	0.119
7 Stall torque	mNm	3.19	3.3	3.56	3.26	3.25	3.16	3.12	3.28	3.01	3.23	3.51	3.22
8 Stall current	A	1.67	1.41	1.32	0.989	0.814	0.639	0.506	0.429	0.368	0.335	0.321	0.254
9 Max. efficiency	%	44	45	46	45	45	44	44	45	43	44	46	44
Characteristics												
10 Terminal resistance	Ω	1.8	2.56	3.18	4.85	7.37	11.3	17.8	28	32.6	44.8	56.1	78.8
11 Terminal inductance	mH	0.036	0.054	0.072	0.108	0.158	0.243	0.377	0.579	0.661	0.921	1.19	1.59
12 Torque constant	mNm/A	1.91	2.35	2.69	3.3	4	4.95	6.17	7.64	8.17	9.64	10.9	12.7
13 Speed constant	rpm/V	5000	4070	3550	2890	2390	1930	1550	1250	1170	990	872	753
14 Speed / torque gradient	rpm/mNm	4700	4440	4190	4250	4410	4390	4460	4570	4660	4600	4470	4680
15 Mechanical time constant	ms	14.2	14.1	14	14	14.1	14.2	14.2	14.3	14.3	14.3	14.2	14.4
16 Rotor inertia	gcm²	0.288	0.303	0.318	0.315	0.306	0.308	0.304	0.3	0.293	0.297	0.303	0.294

Specifications

Thermal data

17	Thermal resistance housing-ambient	46 K/W
18	Thermal resistance winding-housing	14 K/W
19	Thermal time constant winding	5.38 s
20	Thermal time constant motor	231 s
21	Ambient temperature	-20...+85°C
22	Max. winding temperature	+125°C

Mechanical data (sleeve bearings)

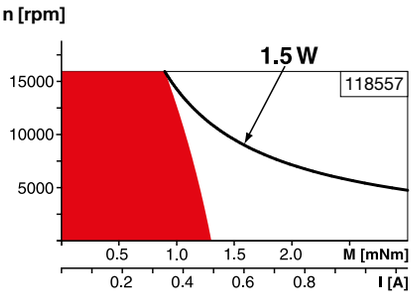
23	Max. speed	16 000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.014 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static)	15 N
	(static, shaft supported)	140 N
28	Max. radial load, 5 mm from flange	1.4 N

Other specifications

29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	15 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Operating Range



Comments

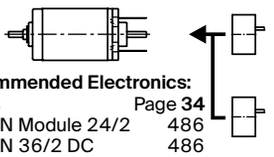
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 34



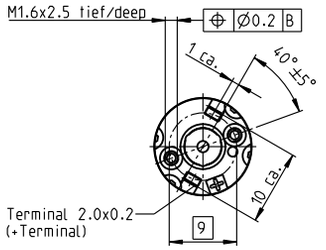
Recommended Electronics:

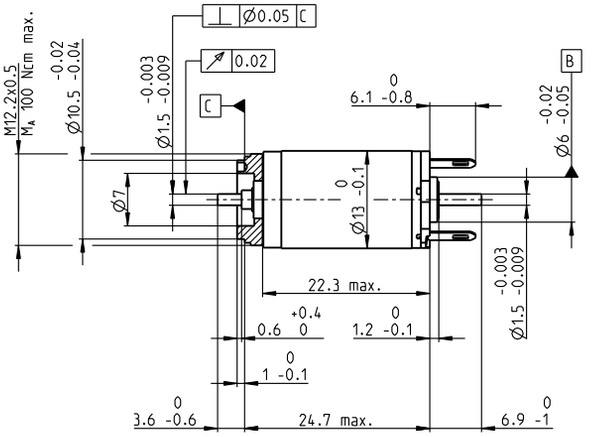
Notes	Page 34
ESCON Module 24/2	486
ESCON 36/2 DC	486
EPOS4 Mod./Comp. 24/1.5	496

Encoder MR
16 CPT,
2 channels
Page 457

Encoder MR
64 - 256 CPT,
2 channels
Page 458/459

RE 13 ∅13 mm, Graphite Brushes, 1.5 Watt





M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

			118570	118571	118572	118573	118574	118575	118576	118577	118578	118579	118580	118581
Motor Data														
	Values at nominal voltage													
1	Nominal voltage	V	3	3.6	4.2	4.8	6	7.2	9	12	12	15	18	20
2	No load speed	rpm	13200	13000	13300	12300	12700	12300	12300	13300	12300	13100	14000	13300
3	No load current	mA	197	159	140	111	92.5	73.7	59.2	49.2	44.7	38.9	35.1	29.7
4	Nominal speed	rpm	8520	7790	8260	7130	7480	7010	7000	8040	6940	7870	8890	8020
5	Nominal torque (max. continuous torque)	mNm	1.06	1.23	1.27	1.28	1.25	1.26	1.25	1.21	1.22	1.21	1.2	1.19
6	Nominal current (max. continuous current)	A	0.72	0.659	0.588	0.481	0.39	0.316	0.252	0.199	0.186	0.157	0.139	0.119
7	Stall torque	mNm	3.19	3.3	3.56	3.26	3.25	3.16	3.12	3.28	3.01	3.23	3.51	3.22
8	Stall current	A	1.67	1.41	1.32	0.989	0.814	0.639	0.506	0.429	0.368	0.335	0.321	0.254
9	Max. efficiency	%	44	45	46	45	45	44	44	45	43	44	46	44
	Characteristics													
10	Terminal resistance	Ω	1.8	2.56	3.18	4.85	7.37	11.3	17.8	28	32.6	44.8	56.1	78.8
11	Terminal inductance	mH	0.036	0.054	0.072	0.108	0.158	0.243	0.377	0.579	0.661	0.921	1.19	1.59
12	Torque constant	mNm/A	1.91	2.35	2.69	3.3	4	4.95	6.17	7.64	8.17	9.64	10.9	12.7
13	Speed constant	rpm/V	5000	4070	3550	2890	2390	1930	1550	1250	1170	990	872	753
14	Speed / torque gradient	rpm/mNm	4700	4440	4190	4250	4410	4390	4460	4570	4660	4600	4470	4680
15	Mechanical time constant	ms	14.2	14.1	14	14	14.1	14.2	14.2	14.3	14.3	14.3	14.2	14.4
16	Rotor inertia	gcm²	0.288	0.303	0.318	0.315	0.306	0.308	0.304	0.3	0.293	0.297	0.303	0.294

Specifications

Thermal data

17	Thermal resistance housing-ambient	46 K/W
18	Thermal resistance winding-housing	14 K/W
19	Thermal time constant winding	5.38 s
20	Thermal time constant motor	231 s
21	Ambient temperature	-20...+85°C
22	Max. winding temperature	+125°C

Mechanical data (sleeve bearings)

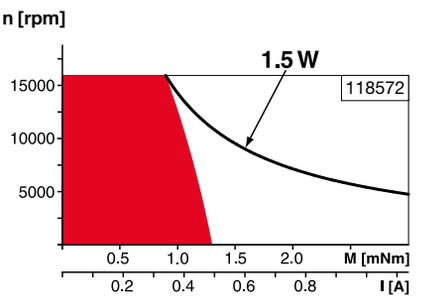
23	Max. speed	16000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.014 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static)	15 N
	(static, shaft supported)	140 N
28	Max. radial load, 5 mm from flange	1.4 N

Other specifications

29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	18 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

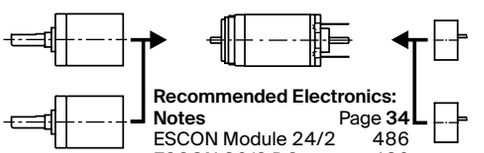
Assigned power rating

maxon Modular System

Details on catalog page 34

Planetary Gearhead
∅13 mm
0.05 - 0.15 Nm
Page 363

Planetary Gearhead
∅13 mm
0.2 - 0.35 Nm
Page 364



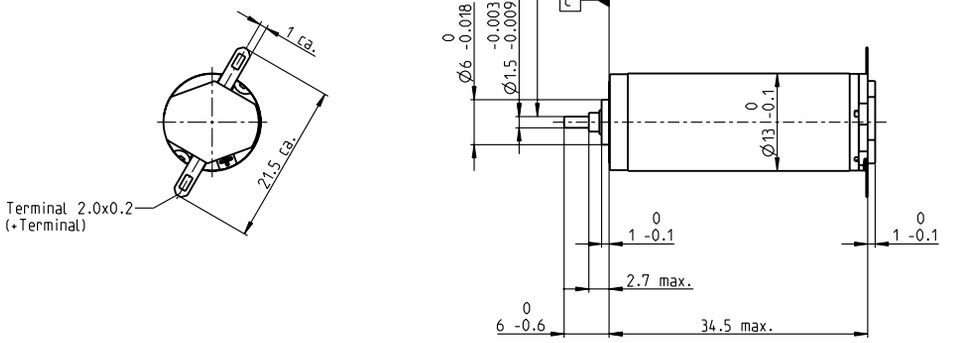
Recommended Electronics:

Notes	Page 34
ESCON Module 24/2	486
ESCON 36/2 DC	486
EPOS4 Mod./Comp. 24/1.5	496

Encoder MR
16 CPT,
2 channels
Page 457

Encoder MR
64 - 256 CPT,
2 channels
Page 458/459

RE 13 ∅13 mm, Graphite Brushes, 3 Watt



M 1:1

Stock program
Standard program
Special program (on request)

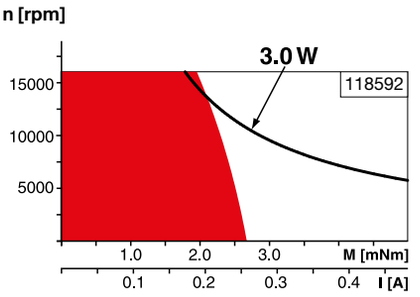
Motor Data		Part Numbers														
		118582	118583	118584	118585	118586	118587	118588	118589	118590	118591	118592	118593	118594	118595	118596
	Values at nominal voltage															
1	Nominal voltage	V	3	3.6	3.6	4.8	6	6	7.2	9	10	12	15	18	21	24	30
2	No load speed	rpm	12000	13600	11900	13600	13600	12100	13100	13800	13200	13300	13400	13000	14100	13800	14000
3	No load current	mA	168	164	136	121	95.5	81	75.3	64	53.9	45.4	36.8	29.2	28	23.8	19.5
4	Nominal speed	rpm	9520	10800	8780	10100	10300	8660	9790	10600	10100	10200	10400	9910	11100	10800	11000
5	Nominal torque (max. continuous torque)	mNm	1.22	1.32	1.58	1.92	2.05	2.17	2.12	2.17	2.32	2.3	2.31	2.36	2.29	2.33	2.28
6	Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.602	0.558	0.495	0.422	0.383	0.319	0.259	0.212	0.192	0.167	0.134
7	Stall torque	mNm	7.44	8.13	7.11	8.58	9.25	8.35	9.03	10.1	10.5	10.4	10.5	10.4	11.1	11	10.9
8	Stall current	A	3.46	3.51	2.69	2.73	2.33	1.87	1.82	1.69	1.52	1.25	1.03	0.814	0.809	0.688	0.556
9	Max. efficiency	%	50	53	53	57	60	60	61	63	64	65	65	66	66	66	66
	Characteristics																
10	Terminal resistance	Ω	0.867	1.02	1.34	1.76	2.57	3.21	3.96	5.32	6.6	9.56	14.6	22.1	26	34.9	54
11	Terminal inductance	mH	0.021	0.025	0.032	0.046	0.073	0.092	0.114	0.164	0.223	0.316	0.486	0.75	0.871	1.19	1.79
12	Torque constant	mNm/A	2.15	2.31	2.65	3.14	3.97	4.46	4.96	5.95	6.94	8.27	10.2	12.7	13.7	16	19.7
13	Speed constant	rpm/V	4440	4130	3610	3040	2410	2140	1930	1600	1380	1160	932	750	696	595	485
14	Speed / torque gradient	rpm/mNm	1790	1830	1830	1700	1560	1540	1540	1430	1310	1340	1330	1300	1320	1300	1330
15	Mechanical time constant	ms	12.8	11.4	10.5	9.44	8.68	8.46	8.23	7.93	7.74	7.62	7.51	7.42	7.39	7.37	7.38
16	Rotor inertia	gcm²	0.681	0.596	0.548	0.53	0.53	0.526	0.512	0.528	0.565	0.545	0.541	0.544	0.536	0.543	0.529

Specifications

	Thermal data	
17	Thermal resistance housing-ambient	33 K/W
18	Thermal resistance winding-housing	7.0 K/W
19	Thermal time constant winding	4.88 s
20	Thermal time constant motor	259 s
21	Ambient temperature	-20...+65°C
22	Max. winding temperature	+85°C
	Mechanical data (sleeve bearings)	
23	Max. speed	16 000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.014 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static)	15 N
28	Max. radial load, 5 mm from flange	1.4 N
	Other specifications	
29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	24 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

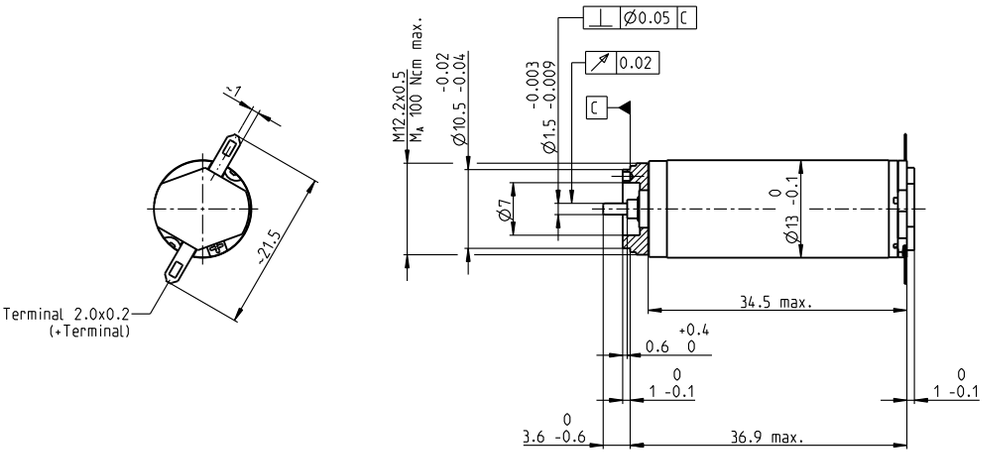
Assigned power rating

maxon Modular System Details on catalog page 34

Recommended Electronics:

Notes	Page **34**
ESCON Module 24/2	486
ESCON 36/2 DC	486
ESCON Module 50/5	487
ESCON 50/5	489

RE 13 ∅13 mm, Graphite Brushes, 3 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

			118597	118598	118599	118600	118601	118602	118603	118604	118605	118606	118607	118608	118609	118610	118611
Motor Data																	
	Values at nominal voltage																
1	Nominal voltage	V	3	3.6	3.6	4.8	6	6	7.2	9	10	12	15	18	21	24	30
2	No load speed	rpm	12000	13600	11900	13600	13600	12100	13100	13800	13200	13300	13400	13000	14100	13800	14000
3	No load current	mA	168	164	136	121	95.5	81	75.3	64	53.9	45.4	36.8	29.2	28	23.8	19.5
4	Nominal speed	rpm	9520	10800	8780	10100	10300	8660	9790	10600	10100	10200	10400	9910	11100	10800	11000
5	Nominal torque (max. continuous torque)	mNm	1.22	1.32	1.58	1.92	2.05	2.17	2.12	2.17	2.32	2.3	2.31	2.36	2.29	2.33	2.28
6	Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.602	0.558	0.495	0.422	0.383	0.319	0.259	0.212	0.192	0.167	0.134
7	Stall torque	mNm	7.44	8.13	7.11	8.58	9.25	8.35	9.03	10.1	10.5	10.4	10.5	10.4	11.1	11	10.9
8	Stall current	A	3.46	3.51	2.69	2.73	2.33	1.87	1.82	1.69	1.52	1.25	1.03	0.814	0.809	0.688	0.556
9	Max. efficiency	%	50	53	53	57	60	60	61	63	64	65	65	66	66	66	66
	Characteristics																
10	Terminal resistance	Ω	0.867	1.02	1.34	1.76	2.57	3.21	3.96	5.32	6.6	9.56	14.6	22.1	26	34.9	54
11	Terminal inductance	mH	0.021	0.025	0.032	0.046	0.073	0.092	0.114	0.164	0.223	0.316	0.486	0.75	0.871	1.19	1.79
12	Torque constant	mNm/A	2.15	2.31	2.65	3.14	3.97	4.46	4.96	5.95	6.94	8.27	10.2	12.7	13.7	16	19.7
13	Speed constant	rpm/V	4440	4130	3610	3040	2410	2140	1930	1600	1380	1160	932	750	696	595	485
14	Speed / torque gradient	rpm/mNm	1790	1830	1830	1700	1560	1540	1540	1430	1310	1340	1330	1300	1320	1300	1330
15	Mechanical time constant	ms	12.8	11.4	10.5	9.44	8.68	8.46	8.23	7.93	7.74	7.62	7.51	7.42	7.39	7.37	7.38
16	Rotor inertia	gcm²	0.681	0.596	0.548	0.53	0.53	0.526	0.512	0.528	0.565	0.545	0.541	0.544	0.536	0.543	0.529

Specifications

Thermal data

17	Thermal resistance housing-ambient	33 K/W
18	Thermal resistance winding-housing	7.0 K/W
19	Thermal time constant winding	4.88 s
20	Thermal time constant motor	259 s
21	Ambient temperature	-20...+65°C
22	Max. winding temperature	+85°C

Mechanical data (sleeve bearings)

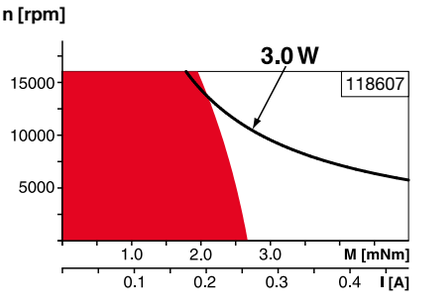
23	Max. speed	16 000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.014 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static)	15 N
28	Max. radial load, 5 mm from flange	1.4 N

Other specifications

29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	27 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

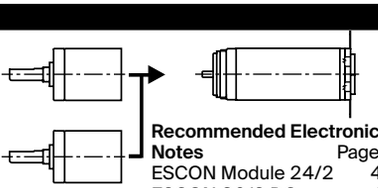
Assigned power rating

maxon Modular System

Details on catalog page 34

Planetary Gearhead
∅13 mm
0.05 - 0.15 Nm
Page 363

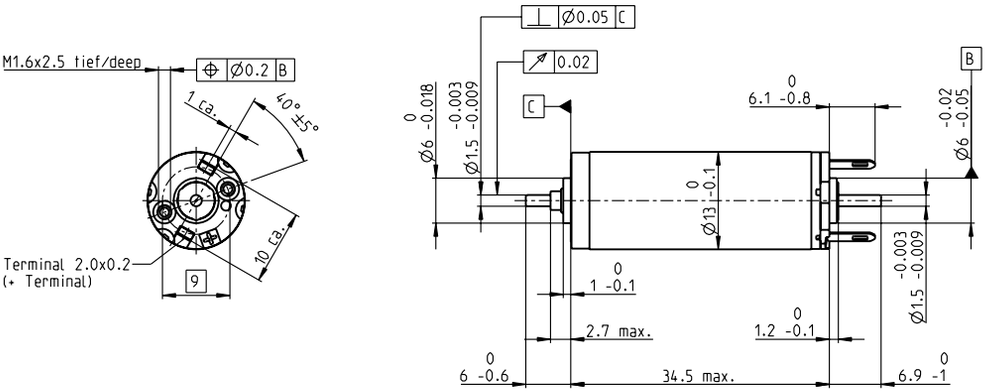
Planetary Gearhead
∅13 mm
0.2 - 0.35 Nm
Page 364



Recommended Electronics:

Notes	Page **34**
ESCON Module 24/2	486
ESCON 36/2 DC	486
ESCON Module 50/5	487
ESCON 50/5	489

RE 13 ∅13 mm, Graphite Brushes, 3 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

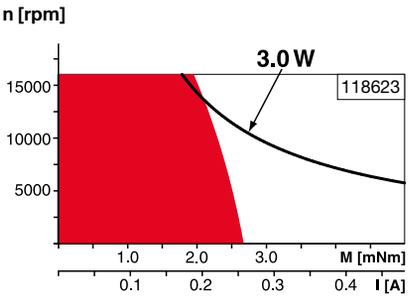
			118613	118614	118615	118616	118617	118618	118619	118620	118621	118622	118623	118624	118625	118626	118627
Motor Data																	
	Values at nominal voltage																
1	Nominal voltage	V	3	3.6	3.6	4.8	6	6	7.2	9	10	12	15	18	21	24	30
2	No load speed	rpm	12000	13600	11900	13600	13600	12100	13100	13800	13200	13300	13400	13000	14100	13800	14000
3	No load current	mA	168	164	136	121	95.5	81	75.3	64	53.9	45.4	36.8	29.2	28	23.8	19.5
4	Nominal speed	rpm	9520	10800	8780	10100	10300	8660	9790	10600	10100	10200	10400	9910	11100	10800	11000
5	Nominal torque (max. continuous torque)	mNm	1.22	1.32	1.58	1.92	2.05	2.17	2.12	2.17	2.32	2.3	2.31	2.36	2.29	2.33	2.28
6	Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.602	0.558	0.495	0.422	0.383	0.319	0.259	0.212	0.192	0.167	0.134
7	Stall torque	mNm	7.44	8.13	7.11	8.58	9.25	8.35	9.03	10.1	10.5	10.4	10.5	10.4	11.1	11	10.9
8	Stall current	A	3.46	3.51	2.69	2.73	2.33	1.87	1.82	1.69	1.52	1.25	1.03	0.814	0.809	0.688	0.556
9	Max. efficiency	%	50	53	53	57	60	60	61	63	64	65	65	66	66	66	66
	Characteristics																
10	Terminal resistance	Ω	0.867	1.02	1.34	1.76	2.57	3.21	3.96	5.32	6.6	9.56	14.6	22.1	26	34.9	54
11	Terminal inductance	mH	0.021	0.025	0.032	0.046	0.073	0.092	0.114	0.164	0.223	0.316	0.486	0.75	0.871	1.19	1.79
12	Torque constant	mNm/A	2.15	2.31	2.65	3.14	3.97	4.46	4.96	5.95	6.94	8.27	10.2	12.7	13.7	16	19.7
13	Speed constant	rpm/V	4440	4130	3610	3040	2410	2140	1930	1600	1380	1160	932	750	696	595	485
14	Speed / torque gradient	rpm/mNm	1790	1830	1830	1700	1560	1540	1540	1430	1310	1340	1330	1300	1320	1300	1330
15	Mechanical time constant	ms	12.8	11.4	10.5	9.44	8.68	8.46	8.23	7.93	7.74	7.62	7.51	7.42	7.39	7.37	7.38
16	Rotor inertia	gcm²	0.681	0.596	0.548	0.53	0.53	0.526	0.512	0.528	0.565	0.545	0.541	0.544	0.536	0.543	0.529

Specifications

	Thermal data	
17	Thermal resistance housing-ambient	33 K/W
18	Thermal resistance winding-housing	7.0 K/W
19	Thermal time constant winding	4.88 s
20	Thermal time constant motor	259 s
21	Ambient temperature	-20...+65°C
22	Max. winding temperature	+85°C
	Mechanical data (sleeve bearings)	
23	Max. speed	16 000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.014 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static)	15 N
	(static, shaft supported)	95 N
28	Max. radial load, 5 mm from flange	1.4 N
	Other specifications	
29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	24 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Operating Range



Comments

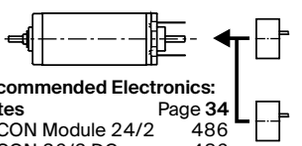
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 34



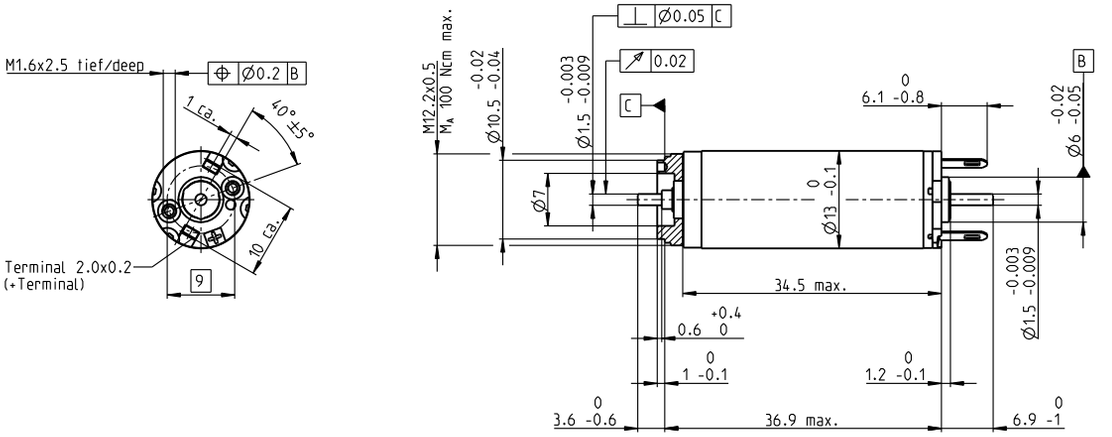
Recommended Electronics:

Notes	Page **34**
ESCON Module 24/2	486
ESCON 36/2 DC	486
ESCON Module 50/5	487
ESCON 50/5	489
EPOS4 Mod./Comp. 24/1.5	496

Encoder MR
16 CPT,
2 channels
Page 457

Encoder MR
64 - 256 CPT,
2 channels
Page 458/459

RE 13 ∅13 mm, Graphite Brushes, 3 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

	118628	118629	118630	118631	118632	118633	118634	118635	118636	118637	118638	118639	118640	118641	118642
Motor Data															
Values at nominal voltage															
1 Nominal voltage	V	3	3.6	3.6	4.8	6	6	7.2	9	10	12	15	18	21	24	30
2 No load speed	rpm	12000	13600	11900	13600	13600	12100	13100	13800	13200	13300	13400	13000	14100	13800	14000
3 No load current	mA	168	164	136	121	95.5	81	75.3	64	53.9	45.4	36.8	29.2	28	23.8	19.5
4 Nominal speed	rpm	9520	10800	8780	10100	10300	8660	9790	10600	10100	10200	10400	9910	11100	10800	11000
5 Nominal torque (max. continuous torque)	mNm	1.22	1.32	1.58	1.92	2.05	2.17	2.12	2.17	2.32	2.3	2.31	2.36	2.29	2.33	2.28
6 Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.602	0.558	0.495	0.422	0.383	0.319	0.259	0.212	0.192	0.167	0.134
7 Stall torque	mNm	7.44	8.13	7.11	8.58	9.25	8.35	9.03	10.1	10.5	10.4	10.5	10.4	11.1	11	10.9
8 Stall current	A	3.46	3.51	2.69	2.73	2.33	1.87	1.82	1.69	1.52	1.25	1.03	0.814	0.809	0.688	0.556
9 Max. efficiency	%	50	53	53	57	60	60	61	63	64	65	65	66	66	66	66
Characteristics																
10 Terminal resistance	Ω	0.867	1.02	1.34	1.76	2.57	3.21	3.96	5.32	6.6	9.56	14.6	22.1	26	34.9	54
11 Terminal inductance	mH	0.021	0.025	0.032	0.046	0.073	0.092	0.114	0.164	0.223	0.316	0.486	0.75	0.871	1.19	1.79
12 Torque constant	mNm/A	2.15	2.31	2.65	3.14	3.97	4.46	4.96	5.95	6.94	8.27	10.2	12.7	13.7	16	19.7
13 Speed constant	rpm/V	4440	4130	3610	3040	2410	2140	1930	1600	1380	1160	932	750	696	595	485
14 Speed / torque gradient	rpm/mNm	1790	1830	1830	1700	1560	1540	1540	1430	1310	1340	1330	1300	1320	1300	1330
15 Mechanical time constant	ms	12.8	11.4	10.5	9.44	8.68	8.46	8.23	7.93	7.74	7.62	7.51	7.42	7.39	7.37	7.38
16 Rotor inertia	gcm²	0.681	0.596	0.548	0.53	0.53	0.526	0.512	0.528	0.565	0.545	0.541	0.544	0.536	0.543	0.529

Specifications

Thermal data

17	Thermal resistance housing-ambient	33 K/W
18	Thermal resistance winding-housing	7.0 K/W
19	Thermal time constant winding	4.88 s
20	Thermal time constant motor	259 s
21	Ambient temperature	-20...+65°C
22	Max. winding temperature	+85°C

Mechanical data (sleeve bearings)

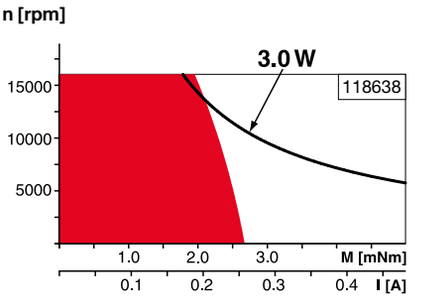
23	Max. speed	16 000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.014 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static)	15 N
	(static, shaft supported)	95 N
28	Max. radial load, 5 mm from flange	1.4 N

Other specifications

29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	27 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

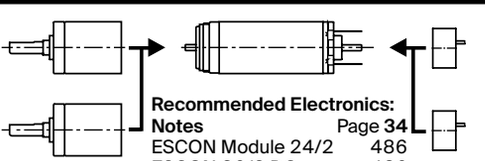
Assigned power rating

maxon Modular System

Details on catalog page 34

Planetary Gearhead
∅13 mm
0.05 - 0.15 Nm
Page 363

Planetary Gearhead
∅13 mm
0.2 - 0.35 Nm
Page 364



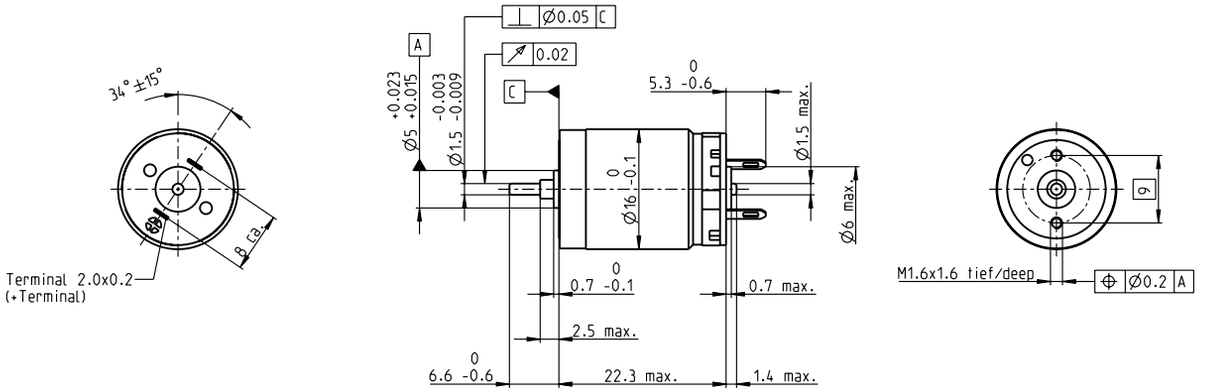
Recommended Electronics:

Notes	Page 34
ESCON Module 24/2	486
ESCON 36/2 DC	486
ESCON Module 50/5	487
ESCON 50/5	489
EPOS4 Mod./Comp. 24/1.5	496

Encoder MR
16 CPT,
2 channels
Page 457

Encoder MR
64 - 256 CPT,
2 channels
Page 458/459

RE 16 ∅16 mm, Precious Metal Brushes CLL, 2 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

			320173	320174	320175	409575	320176	320177	320178	320179
Motor Data										
	Values at nominal voltage									
1	Nominal voltage	V	1.8	3	6	6	9	12	18	24
2	No load speed	rpm	7730	7820	7960	7920	7730	7590	7450	7280
3	No load current	mA	32.2	19.6	10.1	13.8	6.44	5.35	3.08	2.24
4	Nominal speed	rpm	5700	4430	4520	4530	4290	4070	3880	3610
5	Nominal torque (max. continuous torque)	mNm	1.52	2.55	2.54	2.5	2.54	2.45	2.44	2.37
6	Nominal current (max. continuous current)	A	0.72	0.72	0.365	0.364	0.237	0.169	0.11	0.0784
7	Stall torque	mNm	5.83	5.92	5.92	5.92	5.76	5.34	5.13	4.75
8	Stall current	A	2.65	1.64	0.833	0.833	0.524	0.359	0.226	0.153
9	Max. efficiency	%	79	79	79	76	79	77	78	78
	Characteristics									
10	Terminal resistance	Ω	0.679	1.83	7.2	7.2	17.2	33.4	79.8	157
11	Terminal inductance	mH	0.0169	0.0457	0.176	0.176	0.421	0.771	1.81	3.36
12	Torque constant	mNm/A	2.2	3.62	7.11	7.11	11	14.9	22.8	31
13	Speed constant	rpm/V	4350	2640	1340	1340	869	642	420	308
14	Speed / torque gradient	rpm/mNm	1340	1340	1360	1360	1360	1440	1470	1550
15	Mechanical time constant	ms	9.13	8.76	8.67	8.67	8.67	8.77	8.72	8.89
16	Rotor inertia	gcm²	0.65	0.626	0.609	0.609	0.61	0.58	0.565	0.546

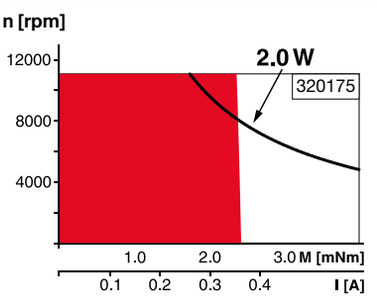
Specifications

	Thermal data	
17	Thermal resistance housing-ambient	40.6 K/W
18	Thermal resistance winding-housing	9.52 K/W
19	Thermal time constant winding	5.33 s
20	Thermal time constant motor	295 s
21	Ambient temperature	-20...+65°C
22	Max. winding temperature	+85°C
	Mechanical data (sleeve bearings)	
23	Max. speed	11000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.014 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static)	15 N
28	Max. radial load, 5 mm from flange	1.5 N
	Other specifications	
29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	21 g

CLL = Capacitor Long Life

Values listed in the table are nominal.
Explanation of the figures on page 72.

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

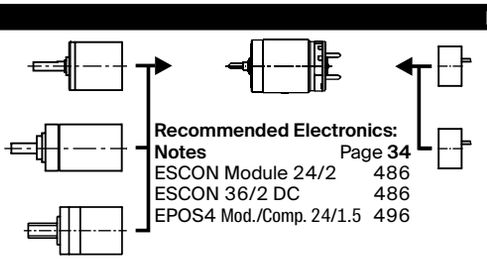
maxon Modular System

Details on catalog page 34

Planetary Gearhead
∅16 mm
0.1 - 0.3 Nm
Page 369

Planetary Gearhead
∅16 mm
0.2 - 0.6 Nm
Page 370

Screw Drive
∅16 mm
Page 411–413



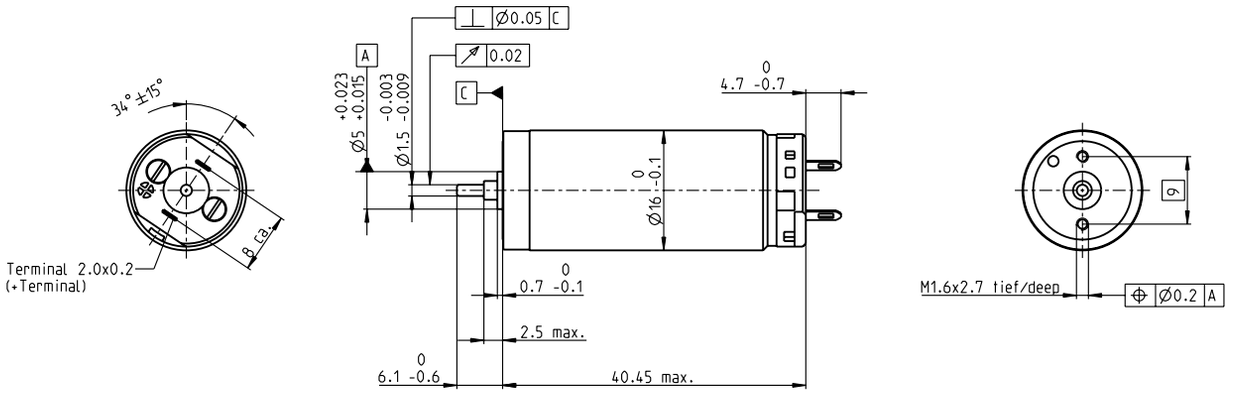
Recommended Electronics:

Notes	Page **34**
ESCON Module 24/2	486
ESCON 36/2 DC	486
EPOS4 Mod./Comp. 24/1.5	496

Encoder MR
32 CPT,
2 / 3 channels
Page 460

Encoder MR
128 / 256 / 512 CPT,
2 / 3 channels
Page 461

RE 16 ∅16 mm, Precious Metal Brushes CLL, 3.2 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

			118678	118679	118680	118681	118682	118683	118684	118685	118686	118687	118688	118689	118690	118691	118692
Motor Data																	
	Values at nominal voltage																
1	Nominal voltage	V	1.8	2.4	3	3.2	4.5	4.8	7.2	9	12	12	15	18	24	30	48
2	No load speed	rpm	4990	6360	6890	6270	6740	5700	6890	6740	7130	5990	6010	5900	7250	6460	5500
3	No load current	mA	23.5	25.4	23	18.6	14.8	10.8	9.57	7.4	6.05	4.63	3.72	3.02	3.11	2.08	1.02
4	Nominal speed	rpm	4320	5510	5820	4930	5050	3630	4810	4630	5030	3830	3840	3730	5070	4220	3180
5	Nominal torque (max. continuous torque)	mNm	2.39	2.5	2.89	3.41	4.48	5.61	5.54	5.48	5.48	5.38	5.36	5.33	5.29	5.18	5.01
6	Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.72	0.711	0.566	0.438	0.348	0.287	0.229	0.187	0.171	0.119	0.0614
7	Stall torque	mNm	15.5	16.9	17.3	15.2	17.4	15.2	18.1	17.4	18.6	14.9	14.9	14.5	17.6	15	11.9
8	Stall current	A	4.53	4.71	4.19	3.13	2.74	1.9	1.82	1.37	1.16	0.784	0.628	0.5	0.561	0.341	0.144
9	Max. efficiency	%	86	86	86	85	86	86	86	86	86	86	85	85	86	85	84
	Characteristics																
10	Terminal resistance	Ω	0.397	0.51	0.715	1.02	1.64	2.53	3.95	6.56	10.3	15.3	23.9	36	42.8	88	333
11	Terminal inductance	mH	0.021	0.023	0.03	0.042	0.071	0.113	0.174	0.284	0.452	0.639	0.993	1.48	1.75	3.44	12.1
12	Torque constant	mNm/A	3.43	3.58	4.13	4.84	6.34	7.99	9.92	12.7	16	19	23.7	28.9	31.4	44.1	82.7
13	Speed constant	rpm/V	2790	2660	2310	1970	1510	1190	962	753	597	502	403	330	304	217	115
14	Speed / torque gradient	rpm/mNm	323	379	400	415	391	378	383	389	386	404	406	410	414	432	465
15	Mechanical time constant	ms	5.84	5.71	5.56	5.46	5.36	5.31	5.29	5.29	5.27	5.29	5.3	5.31	5.31	5.36	5.42
16	Rotor inertia	gcm²	1.73	1.44	1.33	1.26	1.31	1.34	1.32	1.3	1.3	1.25	1.25	1.24	1.23	1.18	1.11

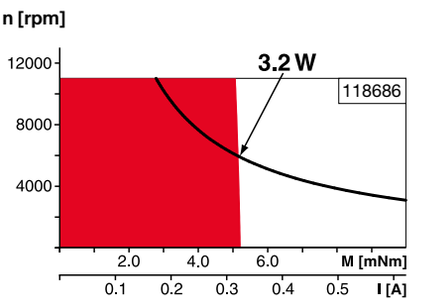
Specifications

	Thermal data	
17	Thermal resistance housing-ambient	30 K/W
18	Thermal resistance winding-housing	8.5 K/W
19	Thermal time constant winding	10.6 s
20	Thermal time constant motor	436 s
21	Ambient temperature	-20...+65°C
22	Max. winding temperature	+85°C
	Mechanical data (sleeve bearings)	
23	Max. speed	11000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.014 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static)	15 N
28	Max. radial load, 5 mm from flange	1.5 N
	Other specifications	
29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	38 g

CLL = Capacitor Long Life

Values listed in the table are nominal.
Explanation of the figures on page 72.

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

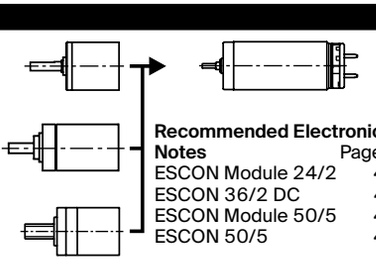
maxon Modular System

Details on catalog page 34

Planetary Gearhead
∅16 mm
0.1 - 0.3 Nm
Page 369

Planetary Gearhead
∅16 mm
0.2 - 0.6 Nm
Page 370

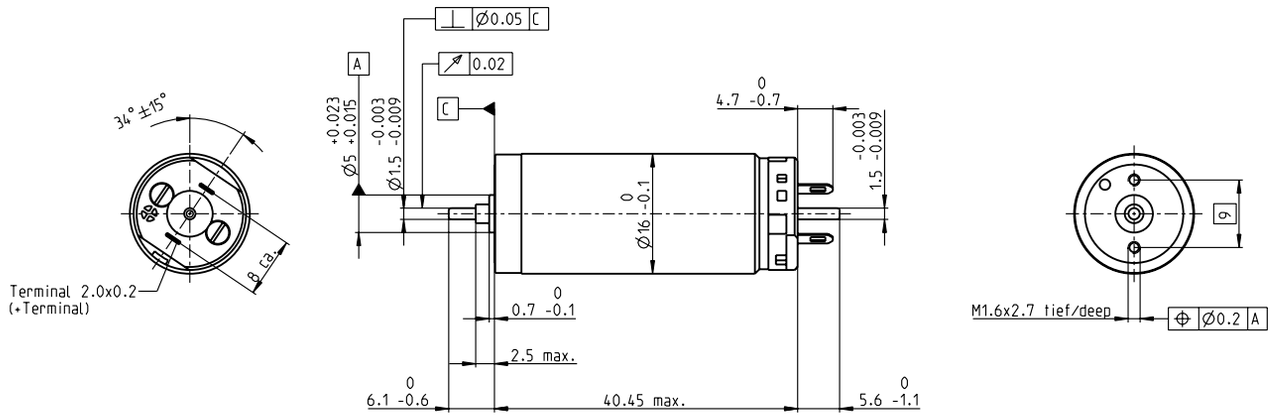
Screw Drive
∅16 mm
Page 411–413



Recommended Electronics:

Notes	Page **34**
ESCON Module 24/2	486
ESCON 36/2 DC	486
ESCON Module 50/5	487
ESCON 50/5	489

RE 16 ∅16 mm, Precious Metal Brushes CLL, 3.2 Watt



M 1:1

Stock program
Standard program
Special program (on request)

			Part Numbers														
			118693	118694	118695	118696	118697	118698	118699	118700	118701	118702	118703	118704	118705	118706	118707
Motor Data																	
	Values at nominal voltage																
1	Nominal voltage	V	1.8	2.4	3	3.2	4.5	4.8	7.2	9	12	12	15	18	24	30	48
2	No load speed	rpm	4990	6360	6890	6270	6740	5700	6890	6740	7130	5990	6010	5900	7250	6460	5500
3	No load current	mA	23.5	25.4	23	18.6	14.8	10.8	9.57	7.4	6.05	4.63	3.72	3.02	3.11	2.08	1.02
4	Nominal speed	rpm	4320	5510	5820	4930	5050	3630	4810	4630	5030	3830	3840	3730	5070	4220	3180
5	Nominal torque (max. continuous torque)	mNm	2.39	2.5	2.89	3.41	4.48	5.61	5.54	5.48	5.48	5.38	5.36	5.33	5.29	5.18	5.01
6	Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.72	0.711	0.566	0.438	0.348	0.287	0.229	0.187	0.171	0.119	0.0614
7	Stall torque	mNm	15.5	16.9	17.3	15.2	17.4	15.2	18.1	17.4	18.6	14.9	14.9	14.5	17.6	15	11.9
8	Stall current	A	4.53	4.71	4.19	3.13	2.74	1.9	1.82	1.37	1.16	0.784	0.628	0.5	0.561	0.341	0.144
9	Max. efficiency	%	86	86	86	85	86	86	86	86	86	86	85	85	86	85	84
	Characteristics																
10	Terminal resistance	Ω	0.397	0.51	0.715	1.02	1.64	2.53	3.95	6.56	10.3	15.3	23.9	36	42.8	88	333
11	Terminal inductance	mH	0.021	0.023	0.03	0.042	0.071	0.113	0.174	0.284	0.452	0.639	0.993	1.48	1.75	3.44	12.1
12	Torque constant	mNm/A	3.43	3.58	4.13	4.84	6.34	7.99	9.92	12.7	16	19	23.7	28.9	31.4	44.1	82.7
13	Speed constant	rpm/V	2790	2660	2310	1970	1510	1190	962	753	597	502	403	330	304	217	115
14	Speed / torque gradient	rpm/mNm	323	379	400	415	391	378	383	389	386	404	406	410	414	432	465
15	Mechanical time constant	ms	5.84	5.71	5.56	5.46	5.36	5.31	5.29	5.29	5.27	5.29	5.3	5.31	5.31	5.36	5.42
16	Rotor inertia	gcm²	1.73	1.44	1.33	1.26	1.31	1.34	1.32	1.3	1.3	1.25	1.25	1.24	1.23	1.18	1.11

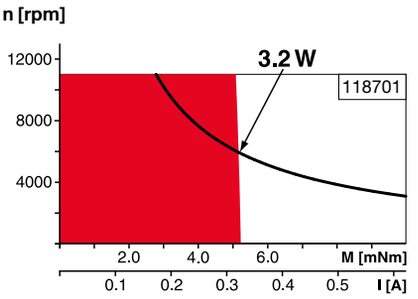
Specifications

	Thermal data	
17	Thermal resistance housing-ambient	30 K/W
18	Thermal resistance winding-housing	8.5 K/W
19	Thermal time constant winding	10.6 s
20	Thermal time constant motor	436 s
21	Ambient temperature	-20...+65°C
22	Max. winding temperature	+85°C
	Mechanical data (sleeve bearings)	
23	Max. speed	11000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.014 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static)	15 N
	(static, shaft supported)	70 N
28	Max. radial load, 5 mm from flange	1.5 N
	Other specifications	
29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	38 g

CLL = Capacitor Long Life

Values listed in the table are nominal.
Explanation of the figures on page 72.

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

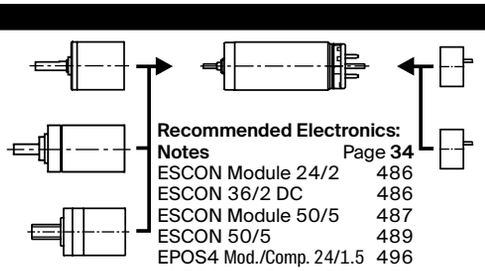
maxon Modular System

Details on catalog page 34

Planetary Gearhead
∅16 mm
0.1 - 0.3 Nm
Page 369

Planetary Gearhead
∅16 mm
0.2 - 0.6 Nm
Page 370

Screw Drive
∅16 mm
Page 411–413



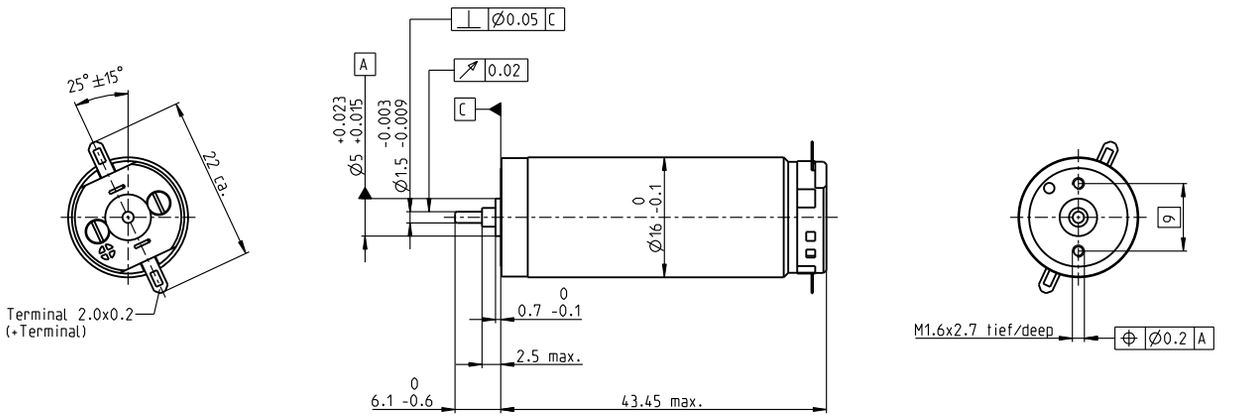
Recommended Electronics:

Notes	Page 34
ESCON Module 24/2	486
ESCON 36/2 DC	486
ESCON Module 50/5	487
ESCON 50/5	489
EPOS4 Mod./Comp. 24/1.5	496
EPOS4 Mod./Comp. 50/5	496
EPOS4 50/5	501

Encoder MR
32 CPT,
2 / 3 channels
Page 460

Encoder MR
128 / 256 / 512 CPT,
2 / 3 channels
Page 461

RE 16 ∅16 mm, Graphite Brushes, 4.5 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

			118710	118711	118712	118713	118714	118715	118716	118717	118718	118719	118720	118721	118722	118723	118724
Motor Data																	
	Values at nominal voltage																
1	Nominal voltage	V	4.8	4.8	6	7.2	9	12	15	18	24	30	36	45	48	48	48
2	No load speed	rpm	12700	12100	13200	13600	13100	13900	14000	13200	14000	14700	14100	14500	14200	10100	5320
3	No load current	mA	105	98.7	87.6	75.4	56.9	45.9	37.1	28.5	23	19.6	15.6	12.8	11.8	7.66	3.63
4	Nominal speed	rpm	11200	10500	11500	11700	11000	11900	12100	11300	12100	12900	12300	12700	12400	8120	3170
5	Nominal torque (max. continuous torque)	mNm	2.15	2.27	2.67	3.18	4.23	4.36	4.42	4.53	4.53	4.4	4.46	4.42	4.43	4.65	4.77
6	Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.712	0.582	0.475	0.379	0.302	0.247	0.2	0.163	0.15	0.111	0.0603
7	Stall torque	mNm	26.3	22.8	25.8	27.4	29.9	34.3	35.3	33.4	36.3	36.8	35.6	36.2	35.4	24.2	12.1
8	Stall current	A	7.56	6.26	6.16	5.58	4.65	4.23	3.51	2.6	2.24	1.91	1.48	1.23	1.11	0.541	0.144
9	Max. efficiency	%	73	72	74	76	77	79	80	80	80	81	81	81	81	78	71
	Characteristics																
10	Terminal resistance	Ω	0.635	0.767	0.975	1.29	1.94	2.83	4.28	6.93	10.7	15.7	24.4	36.5	43.3	88.7	334
11	Terminal inductance	mH	0.021	0.023	0.03	0.042	0.071	0.113	0.174	0.284	0.452	0.639	0.993	1.48	1.74	3.44	12.1
12	Torque constant	mNm/A	3.48	3.64	4.2	4.91	6.43	8.11	10.1	12.9	16.2	19.3	24.1	29.4	31.9	44.8	83.9
13	Speed constant	rpm/V	2750	2630	2280	1940	1480	1180	948	742	589	495	397	325	299	213	114
14	Speed / torque gradient	rpm/mNm	502	554	529	510	447	411	403	399	389	403	402	404	407	423	453
15	Mechanical time constant	ms	9.07	8.35	7.36	6.71	6.13	5.78	5.56	5.43	5.31	5.28	5.25	5.23	5.22	5.24	5.28
16	Rotor inertia	gcm²	1.73	1.44	1.33	1.26	1.31	1.34	1.32	1.3	1.3	1.25	1.25	1.24	1.23	1.18	1.11

Specifications

Thermal data

17	Thermal resistance housing-ambient	30 K/W
18	Thermal resistance winding-housing	8.5 K/W
19	Thermal time constant winding	10.6 s
20	Thermal time constant motor	504 s
21	Ambient temperature	-20...+65°C
22	Max. winding temperature	+85°C

Mechanical data (sleeve bearings)

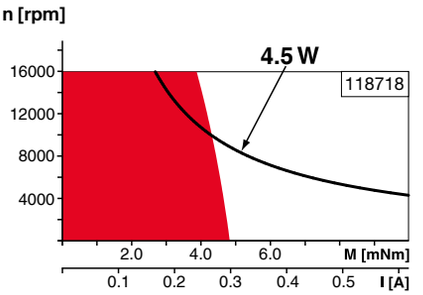
23	Max. speed	16000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.014 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static)	15 N
28	Max. radial load, 5 mm from flange	1.5 N

Other specifications

29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	40 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

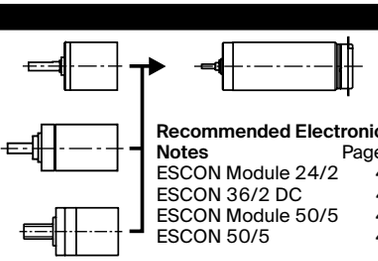
maxon Modular System

Details on catalog page 34

Planetary Gearhead
∅16 mm
0.1 - 0.3 Nm
Page 369

Planetary Gearhead
∅16 mm
0.2 - 0.6 Nm
Page 370

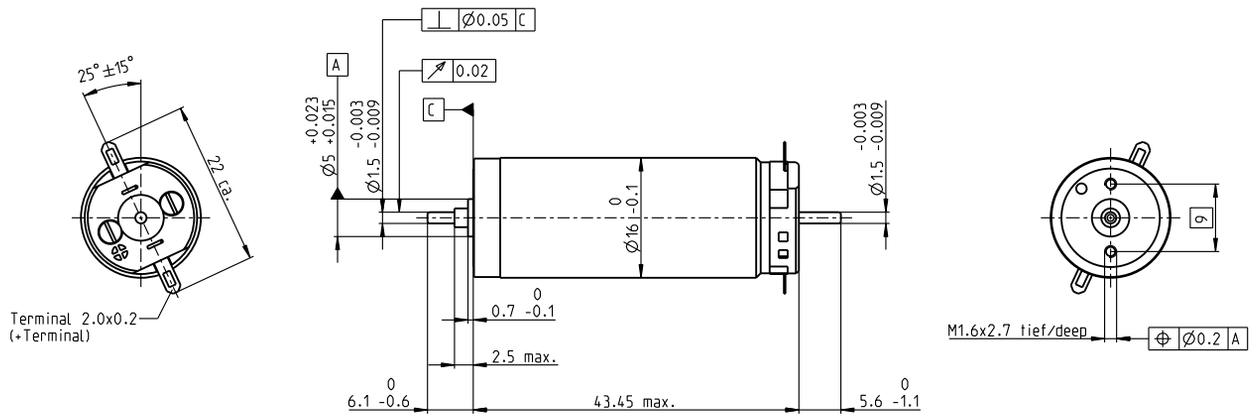
Screw Drive
∅16 mm
Page 411–413



Recommended Electronics:

Notes	Page **34**
ESCON Module 24/2	486
ESCON 36/2 DC	486
ESCON Module 50/5	487
ESCON 50/5	489

RE 16 ∅16 mm, Graphite Brushes, 4.5 Watt



M 1:1

RE

Stock program
Standard program
Special program (on request)

Part Numbers

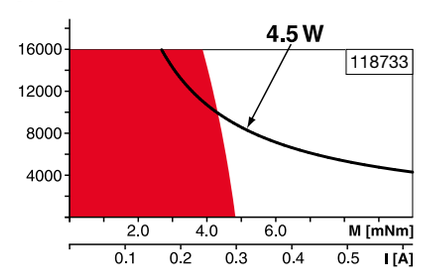
		118725	118726	118727	118728	118729	118730	118731	118732	118733	118734	118735	118736	118737	118738	118739
Motor Data																
	Values at nominal voltage															
1	Nominal voltage	V	4.8	4.8	6	7.2	9	12	15	18	24	30	36	45	48	48	48
2	No load speed	rpm	12700	12100	13200	13600	13100	13900	14000	13200	14000	14700	14100	14500	14200	10100	5320
3	No load current	mA	105	98.7	87.6	75.4	56.9	45.9	37.1	28.5	23	19.6	15.6	12.8	11.8	7.66	3.63
4	Nominal speed	rpm	11200	10500	11500	11700	11000	11900	12200	11300	12200	12900	12300	12700	12400	8130	3170
5	Nominal torque (max. continuous torque)	mNm	2.15	2.27	2.67	3.18	4.09	4.36	4.34	4.48	4.5	4.37	4.44	4.41	4.43	4.65	4.77
6	Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.69	0.582	0.467	0.375	0.299	0.245	0.199	0.162	0.15	0.111	0.0603
7	Stall torque	mNm	26.3	22.7	25.8	27.4	29.9	34.3	35.3	33.4	36.3	36.8	35.6	36.2	35.4	24.2	12.1
8	Stall current	A	7.56	6.26	6.16	5.58	4.65	4.23	3.51	2.6	2.24	1.91	1.48	1.23	1.11	0.541	0.144
9	Max. efficiency	%	69	69	72	73	76	79	79	79	80	80	80	81	81	78	71
	Characteristics																
10	Terminal resistance	Ω	0.635	0.767	0.975	1.29	1.94	2.83	4.28	6.93	10.7	15.7	24.4	36.5	43.3	88.7	334
11	Terminal inductance	mH	0.021	0.023	0.03	0.042	0.071	0.113	0.174	0.285	0.452	0.64	0.994	1.48	1.74	3.44	12.1
12	Torque constant	mNm/A	3.48	3.64	4.2	4.91	6.43	8.11	10.1	12.9	16.2	19.3	24.1	29.4	31.9	44.8	83.9
13	Speed constant	rpm/V	2750	2630	2280	1940	1480	1180	948	742	589	495	397	325	299	213	114
14	Speed / torque gradient	rpm/mNm	502	554	529	511	447	411	403	399	389	403	402	404	407	423	453
15	Mechanical time constant	ms	9.07	8.35	7.36	6.71	6.13	5.78	5.56	5.43	5.31	5.28	5.25	5.23	5.22	5.24	5.28
16	Rotor inertia	gcm²	1.73	1.44	1.33	1.26	1.31	1.34	1.32	1.3	1.3	1.25	1.25	1.24	1.23	1.18	1.11

Specifications

	Thermal data	
17	Thermal resistance housing-ambient	30 K/W
18	Thermal resistance winding-housing	8.5 K/W
19	Thermal time constant winding	10.6 s
20	Thermal time constant motor	459 s
21	Ambient temperature	-20...+65°C
22	Max. winding temperature	+85°C
	Mechanical data (sleeve bearings)	
23	Max. speed	16 000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.014 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static)	15 N
	(static, shaft supported)	60 N
28	Max. radial load, 5 mm from flange	1.5 N
	Other specifications	
29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	40 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

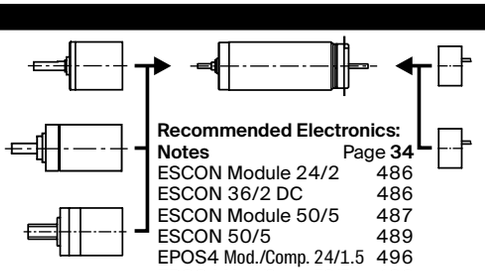
maxon Modular System

Details on catalog page 34

Planetary Gearhead
Ø16 mm
0.1 - 0.3 Nm
Page 369

Planetary Gearhead
Ø16 mm
0.2 - 0.6 Nm
Page 370

Screw Drive
Ø16 mm
Page 411–413



Recommended Electronics:

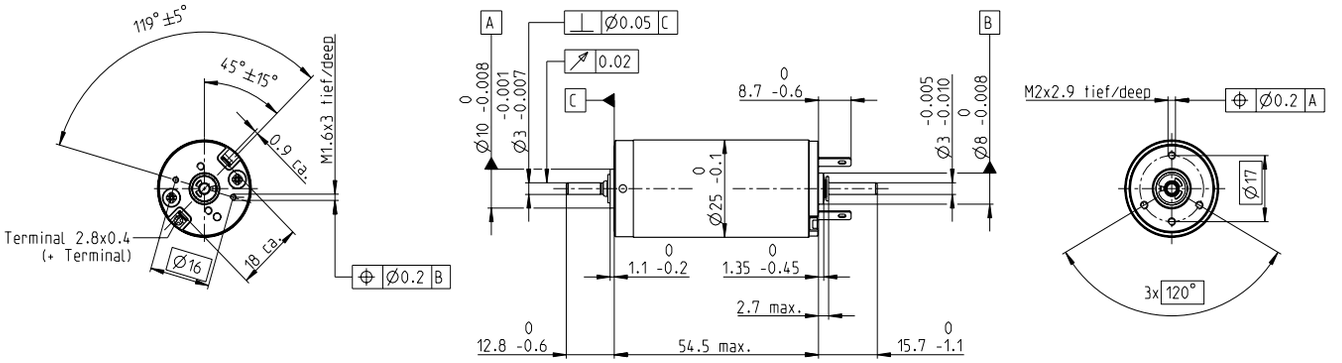
Notes	Page 34
ESCON Module 24/2	486
ESCON 36/2 DC	486
ESCON Module 50/5	487
ESCON 50/5	489
EPOS4 Mod./Comp. 24/1.5	496
EPOS4 Mod./Comp. 50/5	496
EPOS4 50/5	501

Encoder MR
32 CPT,
2 / 3 channels
Page 460

Encoder MR
128 / 256 / 512 CPT,
2 / 3 channels
Page 461

RE 25 ∅25 mm, Precious Metal Brushes CLL, 10 Watt

RE



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

			118740	118741	118742	118743	118744	118745	118746	118747	118748
Motor Data											
	Values at nominal voltage										
1	Nominal voltage	V	4.5	8	9	12	15	18	24	32	48
2	No load speed	rpm	5360	5320	5230	4850	4980	4790	5190	5510	5070
3	No load current	mA	79.7	44.4	38.7	26.3	21.8	9.88	14.4	11.7	6.96
4	Nominal speed	rpm	4980	4520	4220	3800	3920	3710	4130	4450	4000
5	Nominal torque (max. continuous torque)	mNm	11.4	20.9	23.9	28.6	28.2	28.7	28	27.9	27.9
6	Nominal current (max. continuous current)	A	1.5	1.5	1.5	1.24	1.01	0.811	0.652	0.516	0.317
7	Stall torque	mNm	131	132	119	129	131	126	136	144	132
8	Stall current	A	16.5	9.23	7.31	5.5	4.57	3.52	3.1	2.61	1.47
9	Max. efficiency	%	87	87	86	87	87	90	87	87	87
	Characteristics										
10	Terminal resistance	Ω	0.273	0.867	1.23	2.18	3.28	5.11	7.73	12.3	32.6
11	Terminal inductance	mH	0.0275	0.0882	0.115	0.238	0.353	0.551	0.832	1.31	3.48
12	Torque constant	mNm/A	7.99	14.3	16.3	23.5	28.6	35.8	43.9	55.2	89.9
13	Speed constant	rpm/V	1200	668	584	406	334	267	217	173	106
14	Speed / torque gradient	rpm/mNm	40.9	40.5	44	37.7	38.3	38.2	38.3	38.5	38.6
15	Mechanical time constant	ms	4.99	4.4	4.37	4.25	4.23	4.22	4.22	4.22	4.23
16	Rotor inertia	gcm²	11.7	10.4	9.49	10.8	10.6	10.6	10.5	10.5	10.5

Specifications

Thermal data

17	Thermal resistance housing-ambient	14 K/W
18	Thermal resistance winding-housing	3.1 K/W
19	Thermal time constant winding	12.5 s
20	Thermal time constant motor	612 s
21	Ambient temperature	-20...+85°C
22	Max. winding temperature	+100°C

Mechanical data (ball bearings)

23	Max. speed	5500 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	3.2 N
27	Max. force for press fits (static)	64 N
	(static, shaft supported)	800 N
28	Max. radial load, 5 mm from flange	16 N

Other specifications

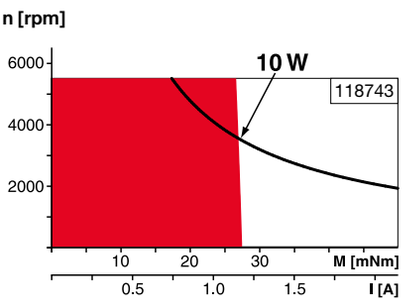
29	Number of pole pairs	1
30	Number of commutator segments	11
31	Weight of motor	130 g

CLL = Capacitor Long Life

Values listed in the table are nominal.
Explanation of the figures on page 72.

Option
Preloaded ball bearings

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

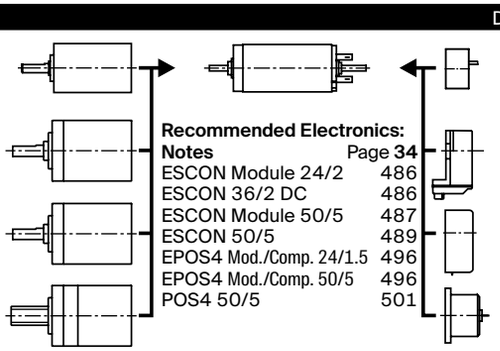
Details on catalog page 34

Planetary Gearhead
∅26 mm
0.75 - 4.5 Nm
Page 381

Planetary Gearhead
∅32 mm
0.75 - 6.0 Nm
Page 383/384/387

Koaxdrive
∅32 mm
1.0 - 4.5 Nm
Page 394

Screw Drive
∅32 mm
Page 416–421



Recommended Electronics:

Notes	Page 34
ESCON Module 24/2	486
ESCON 36/2 DC	486
ESCON Module 50/5	487
ESCON 50/5	489
EPOS4 Mod./Comp. 24/1.5	496
EPOS4 Mod./Comp. 50/5	496
POS4 50/5	501

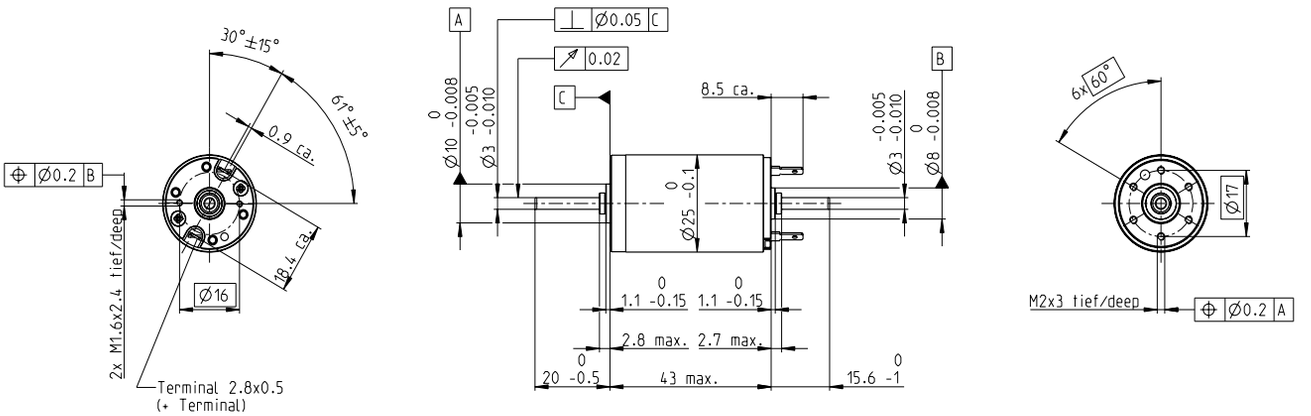
Encoder MR
128 - 1000 CPT,
3 channels
Page 463

Encoder Enc
22 mm
100 CPT, 2 channels
Page 468

Encoder HED_ 5540
500 CPT,
3 channels
Page 471/473

DC-Tacho DCT
∅22 mm
0.52 V
Page 480

RE 25 ∅25 mm, Graphite Brushes, 20 Watt



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

	302534	339149	339150	339151	339152	339153	339154	339155	339156	339157	339158
Motor Data											
Values at nominal voltage											
1 Nominal voltage V	7.2	9	12	18	24	30	36	48	48	48	48
2 No load speed rpm	10500	9710	9620	10400	10900	9210	10100	9540	8450	6720	4650
3 No load current mA	133	93.2	68.1	50.6	40.2	25	23.7	16.4	13.7	9.89	6
4 Nominal speed rpm	8970	8260	8310	9190	9690	8010	8860	8360	7270	5530	3430
5 Nominal torque (max. continuous torque) mNm	21.9	24.4	27.5	29.1	30.4	31.4	30.7	31.7	32.3	32.9	32.8
6 Nominal current (max. continuous current) A	3.68	2.97	2.45	1.85	1.5	1.04	0.931	0.68	0.614	0.495	0.341
7 Stall torque mNm	259	238	268	297	325	265	279	270	243	192	127
8 Stall current A	42.1	28.1	23.2	18.4	15.6	8.61	8.24	5.67	4.51	2.84	1.3
9 Max. efficiency %	79	81	84	86	88	88	88	89	88	88	86
Characteristics											
10 Terminal resistance Ω	0.171	0.32	0.517	0.98	1.53	3.49	4.37	8.47	10.6	16.9	36.8
11 Terminal inductance mH	0.016	0.031	0.057	0.112	0.186	0.407	0.493	0.979	1.25	1.97	4.11
12 Torque constant mNm/A	6.15	8.46	11.5	16.1	20.8	30.8	33.8	47.7	53.8	67.7	97.6
13 Speed constant rpm/V	1550	1130	828	591	460	311	282	200	177	141	97.8
14 Speed / torque gradient rpm/mNm	43.2	42.8	37.1	35.9	34	35.2	36.5	35.6	35.1	35.2	36.9
15 Mechanical time constant ms	6.52	6.06	5.62	5.36	5.24	5.17	5.16	5.13	5.12	5.12	5.14
16 Rotor inertia gcm²	14.4	13.5	14.5	14.3	14.7	14	13.5	13.8	13.9	13.9	13.3

Specifications

Thermal data

17	Thermal resistance housing-ambient	14.4 K/W
18	Thermal resistance winding-housing	5.1 K/W
19	Thermal time constant winding	27.7 s
20	Thermal time constant motor	543 s
21	Ambient temperature	-30...+100°C
22	Max. winding temperature	+155°C

Mechanical data (ball bearings)

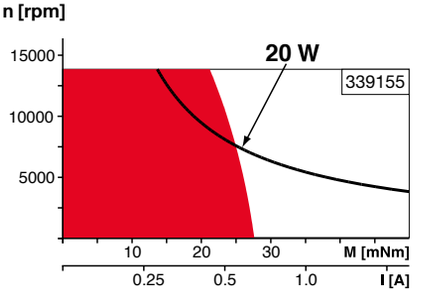
23	Max. speed	14 000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	20 N
27	Max. force for press fits (static)	60 N
	(static, shaft supported)	1000 N
28	Max. radial load, 5 mm from flange	35 N

Other specifications

29	Number of pole pairs	1
30	Number of commutator segments	11
31	Weight of motor	115 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 34

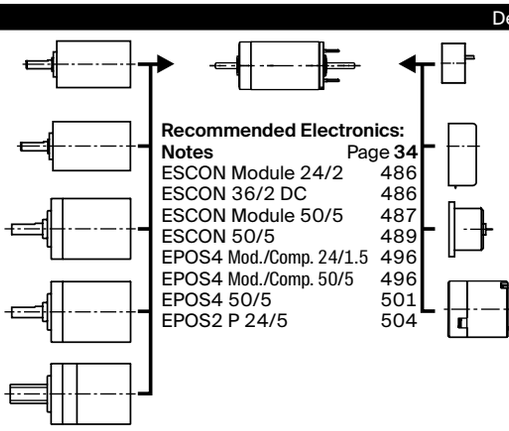
Planetary Gearhead
∅22 mm
0.5 Nm
Page 375

Planetary Gearhead
∅26 mm
0.75 - 4.5 Nm
Page 381

Planetary Gearhead
∅32 mm
0.75 - 6.0 Nm
Page 383/384/387

Koaxdrive
∅32 mm
1.0 - 4.5 Nm
Page 394

Screw Drive
∅32 mm
Page 416–421



Recommended Electronics:

Notes	Page 34
ESCON Module 24/2	486
ESCON 36/2 DC	486
ESCON Module 50/5	487
ESCON 50/5	489
EPOS4 Mod./Comp. 24/1.5	496
EPOS4 Mod./Comp. 50/5	496
EPOS4 50/5	501
EPOS2 P 24/5	504

Encoder MR
128 - 1000 CPT,
3 channels
Page 463

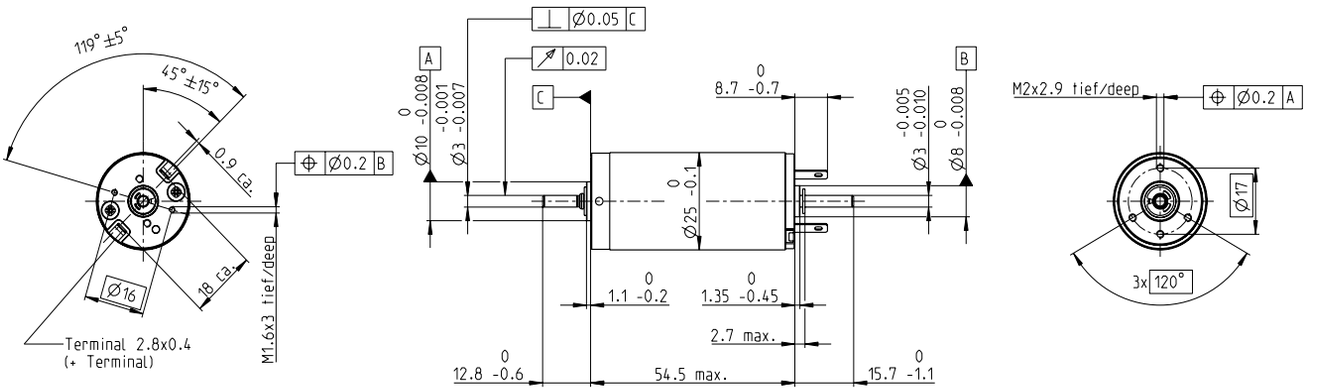
Encoder HED_ 5540
500 CPT,
3 channels
Page 472/473

DC-Tacho DCT
∅22 mm
0.52 V
Page 480

Brake AB 28
24 VDC
0.4 Nm
Page 519

RE 25 ∅25 mm, Graphite Brushes, 20 Watt

RE



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

according to dimensional drawing	118749	118750	118751	118752	118753	118754	118755	118756	118757
shaft length 15.7 shortened to 4 mm	302002	302003	302004	302005	302006	302007	302001	302008	302009
Motor Data									
Values at nominal voltage									
1 Nominal voltage	V	9	15	18	24	30	42	48	48	48
2 No load speed	rpm	10000	9660	10200	9560	9860	11100	10300	8240	5050
3 No load current	mA	110	60.8	53.9	36.9	30.5	25.2	20.1	15.2	8.52
4 Nominal speed	rpm	8970	8430	8850	8330	8640	9920	9160	7040	3830
5 Nominal torque (max. continuous torque)	mNm	11.1	20.5	22.9	26.3	26.7	27.1	27.7	28.7	30
6 Nominal current (max. continuous current)	A	1.5	1.5	1.46	1.16	0.968	0.784	0.653	0.536	0.343
7 Stall torque	mNm	232	225	220	243	249	283	264	209	129
8 Stall current	A	29.1	15.8	13.5	10.4	8.72	7.94	6.03	3.81	1.44
9 Max. efficiency	%	76	82	83	85	86	87	87	86	84
Characteristics									
10 Terminal resistance	Ω	0.309	0.952	1.33	2.32	3.44	5.29	7.96	12.6	33.4
11 Terminal inductance	mH	0.028	0.088	0.115	0.238	0.353	0.551	0.832	1.31	3.48
12 Torque constant	mNm/A	7.96	14.3	16.3	23.4	28.5	35.6	43.8	55	89.6
13 Speed constant	rpm/V	1200	670	586	408	335	268	218	174	107
14 Speed / torque gradient	rpm/mNm	46.5	44.7	48	40.3	40.4	39.8	39.6	39.8	39.7
15 Mechanical time constant	ms	5.68	4.87	4.77	4.55	4.47	4.4	4.37	4.37	4.35
16 Rotor inertia	gcm²	11.7	10.4	9.49	10.8	10.6	10.6	10.5	10.5	10.5

Specifications

Thermal data

17	Thermal resistance housing-ambient	14 K/W
18	Thermal resistance winding-housing	3.1 K/W
19	Thermal time constant winding	12.5 s
20	Thermal time constant motor	612 s
21	Ambient temperature	-30...+100°C
22	Max. winding temperature	+125°C

Mechanical data (ball bearings)

23	Max. speed	14 000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	3.2 N
27	Max. force for press fits (static)	64 N
	(static, shaft supported)	800 N
28	Max. radial load, 5 mm from flange	16 N

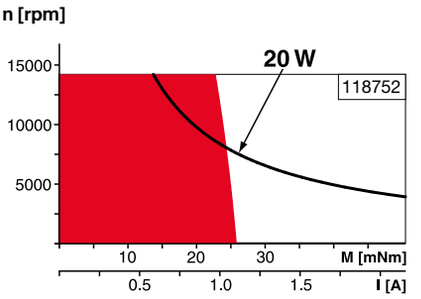
Other specifications

29	Number of pole pairs	1
30	Number of commutator segments	11
31	Weight of motor	130 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Option
Preloaded ball bearings

Operating Range



Comments

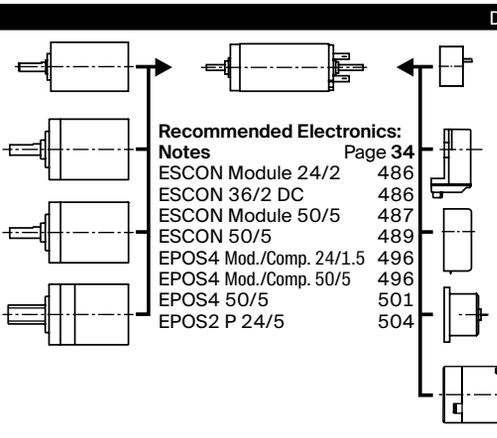
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 34



Planetary Gearhead
∅26 mm
0.75 - 4.5 Nm
Page 381

Planetary Gearhead
∅32 mm
0.75 - 6.0 Nm
Page 383/384/387

Koaxdrive
∅32 mm
1.0 - 4.5 Nm
Page 394

Screw Drive
∅32 mm
Page 416–421

Recommended Electronics:

Notes	Page 34
ESCON Module 24/2	486
ESCON 36/2 DC	486
ESCON Module 50/5	487
ESCON 50/5	489
EPOS4 Mod./Comp. 24/1.5	496
EPOS4 Mod./Comp. 50/5	496
EPOS4 50/5	501
EPOS2 P 24/5	504

Encoder MR
128 - 1000 CPT,
3 channels
Page 463

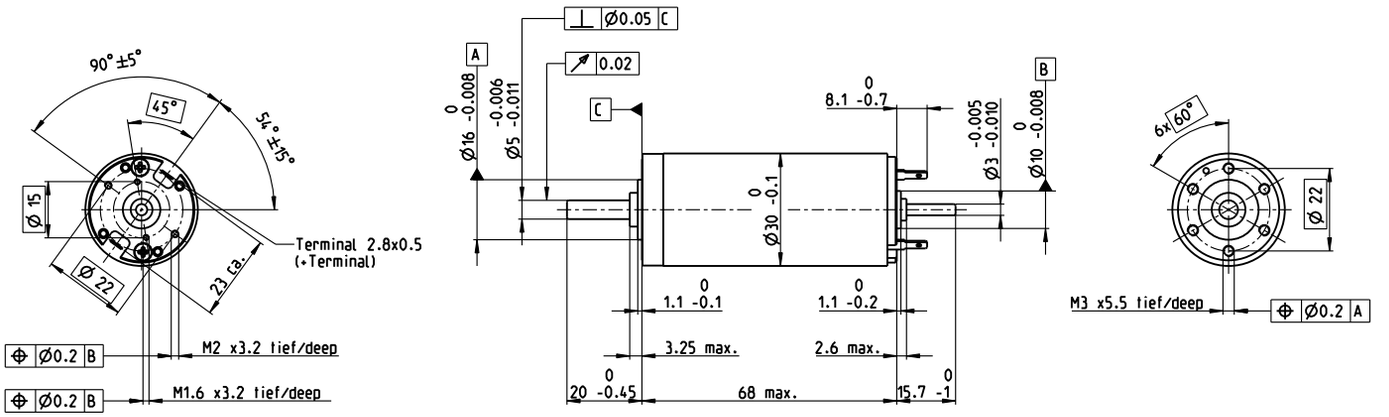
Encoder Enc
22 mm
100 CPT, 2 channels
Page 468

Encoder HED_ 5540
500 CPT,
3 channels
Page 471/473

DC-Tacho DCT
∅22 mm
0.52 V
Page 480

Brake AB 28
24 VDC
0.4 Nm
Page 519

RE 30 ∅30 mm, Precious Metal Brushes, 15 Watt



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

	448593	448594	448595	448596
Motor Data (provisional)				
Values at nominal voltage				
1 Nominal voltage V	6	9	12	18
2 No load speed rpm	2870	3310	2870	3190
3 No load current mA	41.6	33.4	20.8	15.9
4 Nominal speed rpm	2450	2870	2420	2770
5 Nominal torque (max. continuous torque) mNm	53	53	53	53
6 Nominal current (max. continuous current) A	2.7	2.08	1.35	1
7 Stall torque mNm	364	402	342	401
8 Stall current A	18.3	15.5	8.58	7.45
9 Max. efficiency %	90	91	90	91
Characteristics				
10 Terminal resistance Ω	0.378	0.63	1.45	2.47
11 Terminal inductance mH	0.07	0.119	0.281	0.513
12 Torque constant mNm/A	19.9	25.9	39.8	53.8
13 Speed constant rpm/V	479	369	240	178
14 Speed / torque gradient rpm/mNm	9.1	8.97	8.71	8.14
15 Mechanical time constant ms	3.42	3.14	3.02	2.96
16 Rotor inertia gcm²	35.9	33.5	33.1	34.7

Specifications

Thermal data

17	Thermal resistance housing-ambient	6 K/W
18	Thermal resistance winding-housing	1.7 K/W
19	Thermal time constant winding	16.9 s
20	Thermal time constant motor	593 s
21	Ambient temperature	-20...+85°C
22	Max. winding temperature	+100°C

Mechanical data (ball bearings)

23	Max. speed	3300 rpm
24	Axial play at axial load	0.05 - 0.15 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	5.6 N
27	Max. force for press fits (static)	110 N
	(static, shaft supported)	1200 N
28	Max. radial load, 5 mm from flange	28 N

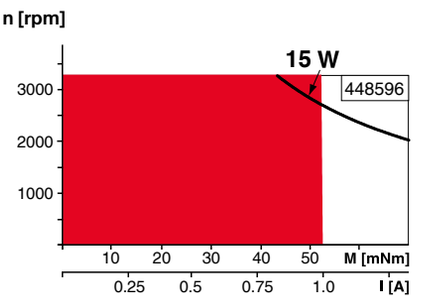
Other specifications

29	Number of pole pairs	1
30	Number of commutator segments	13
31	Weight of motor	260 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Option
Preloaded ball bearings

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

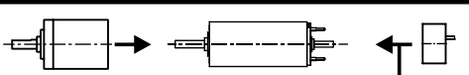
Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 34

Planetary Gearhead
∅32 mm
0.75 - 4.5 Nm
Page 385



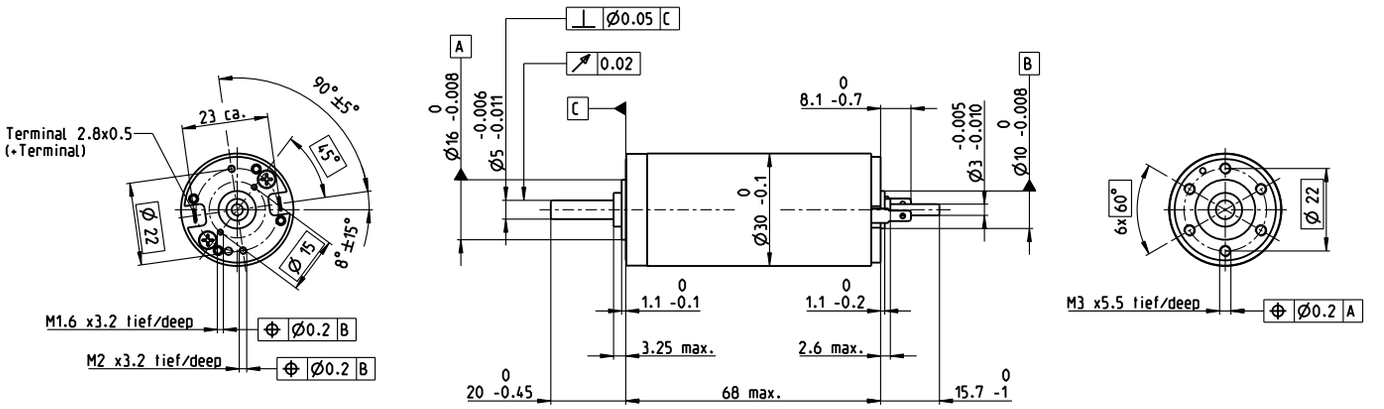
Encoder MR
256 - 1024 CPT,
3 channels
Page 464

Encoder HED_ 5540
500 CPT,
3 channels
Page 471/473

Recommended Electronics:

Notes	Page **34**
ESCON Module 24/2	486
ESCON 36/2 DC	486
ESCON Module 50/5	487
ESCON 50/5	489
EPOS4 Mod./Comp. 24/1.5	496
EPOS4 Mod./Comp. 50/5	496
EPOS4 50/5	501
EPOS2 P 24/5	504

RE 30 ∅30 mm, Graphite Brushes, 60 Watt



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

according to dimensional drawing	310005	310006	310007	310008	310009
shaft length 15.7 shortened to 8.7 mm	268193	268213	268214	268215	268216
Motor Data					
Values at nominal voltage					
1 Nominal voltage V	12	18	24	36	48
2 No load speed rpm	8170	8590	8810	8590	8490
3 No load current mA	301	213	165	106	78.6
4 Nominal speed rpm	7630	7910	8050	7840	7760
5 Nominal torque (max. continuous torque) mNm	51.6	75.5	85.6	86.6	89.7
6 Nominal current (max. continuous current) A	4	4	3.47	2.28	1.74
7 Stall torque mNm	853	1000	1020	1000	1050
8 Stall current A	61.1	50.3	39.3	25.2	19.6
9 Max. efficiency %	85	87	87	87	88
Characteristics					
10 Terminal resistance Ω	0.196	0.358	0.611	1.43	2.45
11 Terminal inductance mH	0.034	0.07	0.119	0.281	0.513
12 Torque constant mNm/A	13.9	19.9	25.9	39.8	53.8
13 Speed constant rpm/V	685	479	369	240	178
14 Speed / torque gradient rpm/mNm	9.64	8.61	8.7	8.61	8.09
15 Mechanical time constant ms	3.4	3.24	3.05	2.98	2.94
16 Rotor inertia gcm²	33.7	35.9	33.5	33.1	34.7

Specifications

Thermal data

17	Thermal resistance housing-ambient	6.0 K/W
18	Thermal resistance winding-housing	1.7 K/W
19	Thermal time constant winding	16.3 s
20	Thermal time constant motor	593 s
21	Ambient temperature	-30...+100°C
22	Max. winding temperature	+125°C

Mechanical data (ball bearings)

23	Max. speed	12000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	5.6 N
27	Max. force for press fits (static)	110 N
	(static, shaft supported)	1200 N
28	Max. radial load, 5 mm from flange	28 N

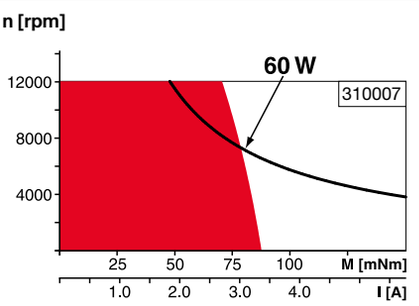
Other specifications

29	Number of pole pairs	1
30	Number of commutator segments	13
31	Weight of motor	260 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Option
Preloaded ball bearings

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

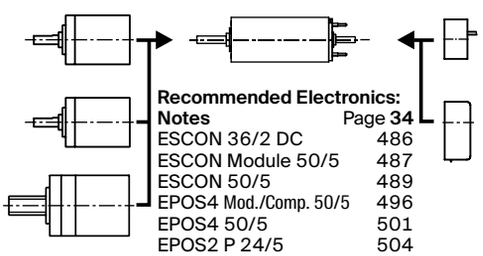
maxon Modular System

Details on catalog page 34

Planetary Gearhead
∅32 mm
0.75 - 6.0 Nm
Page 383-390

Koaxdrive
∅32 mm
1.0 - 4.5 Nm
Page 394

Screw Drive
∅32 mm
Page 416-421



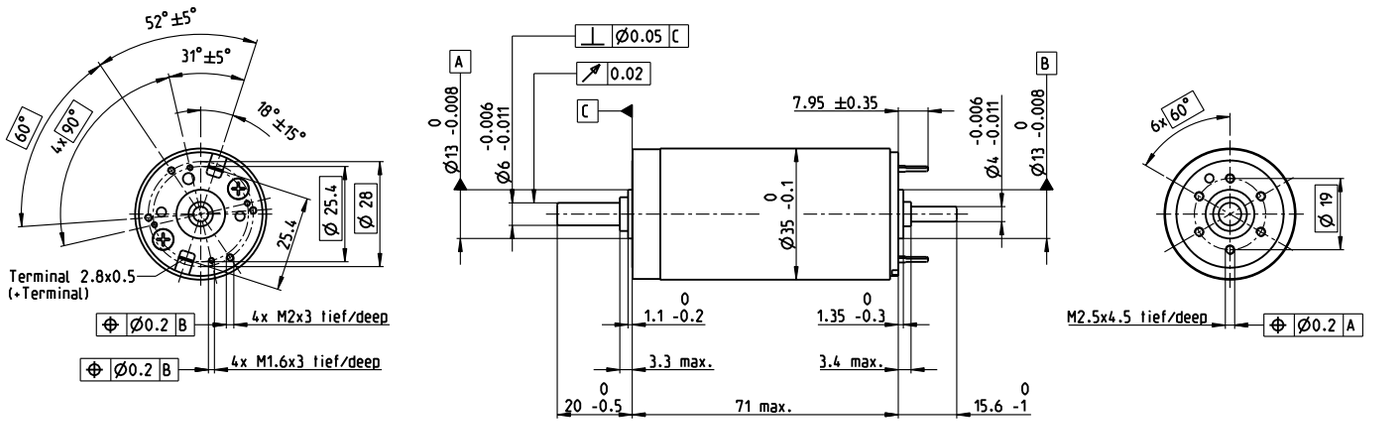
Recommended Electronics:

Notes	Page 34
ESCON 36/2 DC	486
ESCON Module 50/5	487
ESCON 50/5	489
EPOS4 Mod./Comp. 50/5	496
EPOS4 50/5	501
EPOS2 P 24/5	504

Encoder MR
256 - 1024 CPT,
3 channels
Page 464

Encoder HED_ 5540
500 CPT,
3 channels
Page 471/473

RE 35 ∅35 mm, Graphite Brushes, 90 Watt



M 1:2

Stock program
Standard program
Special program (on request)

	Part Numbers													
according to dimensional drawing	273752	323890	273753	273754	273755	273756	273757	273758	273759	273760	273761	273762	273763	
shaft length 15.6 shortened to 4 mm	285785	323891	285786	285787	285788	285789	285790	285791	285792	285793	285794	285795	285796	
Motor Data														
Values at nominal voltage														
1 Nominal voltage	V	15	24	30	42	48	48	48	48	48	48	48	48	48
2 No load speed	rpm	7200	7750	7280	7580	7310	6680	5990	4770	3830	3150	2590	2110	1630
3 No load current	mA	188	128	94.1	70.5	58.9	52.6	46	34.9	27	21.6	17.3	13.9	10.5
4 Nominal speed	rpm	6500	6990	6470	6800	6510	5870	5170	3930	2990	2290	1720	1230	737
5 Nominal torque (max. continuous torque)	mNm	74.2	105	101	105	103	104	104	106	108	107	107	106	106
6 Nominal current (max. continuous current)	A	4	3.72	2.68	2.07	1.71	1.58	1.41	1.15	0.934	0.764	0.628	0.508	0.393
7 Stall torque	mNm	931	1200	976	1090	983	892	778	621	499	399	323	256	196
8 Stall current	A	47.9	41.2	25.1	20.7	15.8	13.1	10.3	6.52	4.21	2.77	1.85	1.2	0.71
9 Max. efficiency	%	85	87	87	88	88	87	86	85	84	83	81	79	77
Characteristics														
10 Terminal resistance	Ω	0.313	0.582	1.2	2.03	3.04	3.66	4.68	7.36	11.4	17.3	26	40.1	67.6
11 Terminal inductance	mH	0.085	0.191	0.34	0.62	0.87	1.04	1.29	2.04	3.16	4.65	6.89	10.3	17.1
12 Torque constant	mNm/A	19.4	29.2	38.9	52.5	62.2	68	75.8	95.2	119	144	175	214	276
13 Speed constant	rpm/V	491	328	246	182	154	140	126	100	80.5	66.4	54.6	44.7	34.6
14 Speed / torque gradient	rpm/mNm	7.91	6.54	7.55	7.03	7.5	7.55	7.77	7.75	7.74	7.99	8.1	8.38	8.47
15 Mechanical time constant	ms	5.62	5.41	5.37	5.32	5.32	5.32	5.33	5.33	5.33	5.34	5.35	5.36	5.38
16 Rotor inertia	gcm²	67.9	79	67.9	72.3	67.7	67.2	65.4	65.7	65.7	63.8	63	61	60.6

Specifications

Thermal data

17	Thermal resistance housing-ambient	6.2 K/W
18	Thermal resistance winding-housing	2 K/W
19	Thermal time constant winding	30.1 s
20	Thermal time constant motor	707 s
21	Ambient temperature	-30...+100°C
22	Max. winding temperature	+155°C

Mechanical data (ball bearings)

23	Max. speed	12000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	5.6 N
27	Max. force for press fits (static)	110 N
	(static, shaft supported)	1200 N
28	Max. radial load, 5 mm from flange	28 N

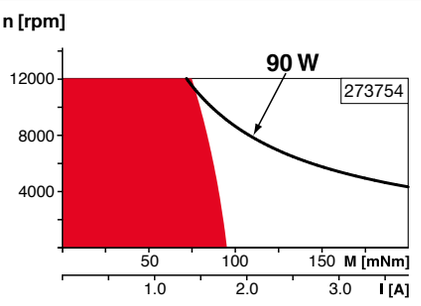
Other specifications

29	Number of pole pairs	1
30	Number of commutator segments	13
31	Weight of motor	340 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Option
Hollow shaft as special design
Preloaded ball bearings

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

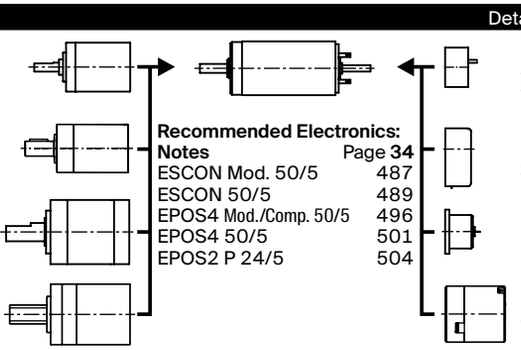
Details on catalog page 34

Planetary Gearhead
∅32 mm
0.75 - 6.0 Nm
Page 383–390

Planetary Gearhead
∅32 mm
4.0 - 8.0 Nm
Page 391

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 396

Screw Drive
∅32 mm
Page 416–421



Recommended Electronics:

Notes	Page 34
ESCON Mod. 50/5	487
ESCON 50/5	489
EPOS4 Mod./Comp. 50/5	496
EPOS4 50/5	501
EPOS2 P 24/5	504

Encoder MR
256 - 1024 CPT,
3 channels
Page 464

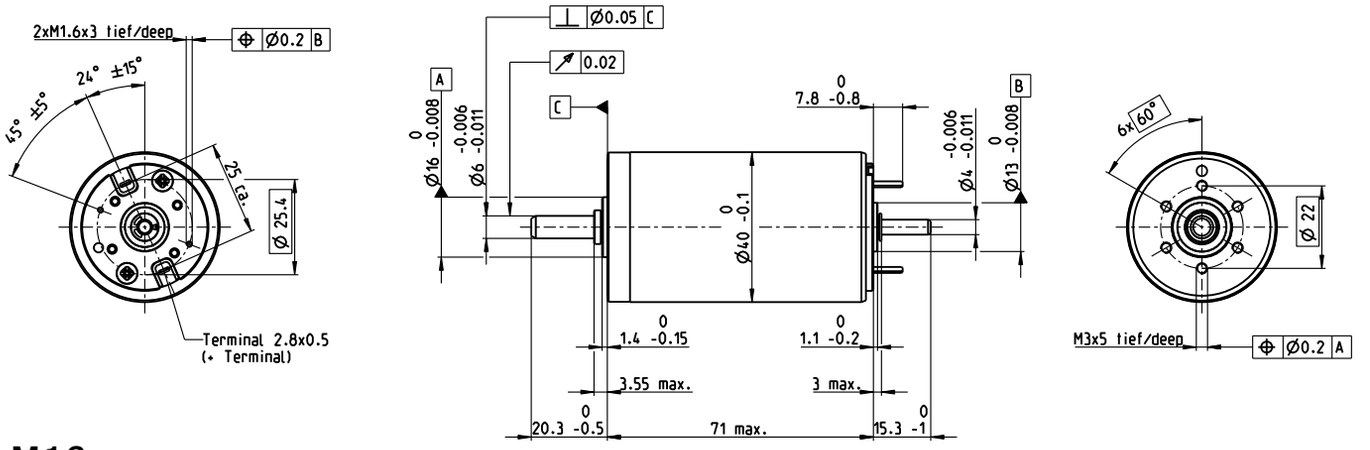
Encoder HED_ 5540
500 CPT,
3 channels
Page 471/473

DC-Tacho DCT
∅22 mm
0.52 V
Page 480

Brake AB 28
24 VDC
0.4 Nm
Page 519

End cap
Page 525

RE 40 ∅40 mm, Precious Metal Brushes, 25 Watt



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

		448588	448589	448590	448591	448592
Motor Data (provisional)						
	Values at nominal voltage					
1	Nominal voltage	V	9	18	24	42	48
2	No load speed	rpm	2850	2850	2780	2920	2690
3	No load current	mA	49.7	24.8	18.1	11	8.62
4	Nominal speed	rpm	2560	2580	2470	2640	2400
5	Nominal torque (max. continuous torque)	mNm	87.8	87.8	88.2	87.6	87.6
6	Nominal current (max. continuous current)	A	2.96	1.48	1.09	0.65	0.524
7	Stall torque	mNm	873	956	794	895	818
8	Stall current	A	29	15.9	9.66	6.53	4.81
9	Max. efficiency	%	92	92	92	92	92
	Characteristics						
10	Terminal resistance	Ω	0.311	1.14	2.49	6.43	9.97
11	Terminal inductance	mH	0.082	0.33	0.613	1.7	2.62
12	Torque constant	mNm/A	30.2	60.3	82.2	137	170
13	Speed constant	rpm/V	317	158	116	69.7	56.2
14	Speed / torque gradient	rpm/mNm	3.27	2.98	3.51	3.27	3.3
15	Mechanical time constant	ms	4.85	4.29	4.36	4.14	4.13
16	Rotor inertia	gcm²	142	137	119	121	120

Specifications

Thermal data

17	Thermal resistance housing-ambient	4.65 K/W
18	Thermal resistance winding-housing	1.93 K/W
19	Thermal time constant winding	41.5 s
20	Thermal time constant motor	809 s
21	Ambient temperature	-20...+85°C
22	Max. winding temperature	+100°C

Mechanical data (ball bearings)

23	Max. speed	3330 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	5.6 N
27	Max. force for press fits (static)	110 N
	(static, shaft supported)	1200 N
28	Max. radial load, 5 mm from flange	28 N

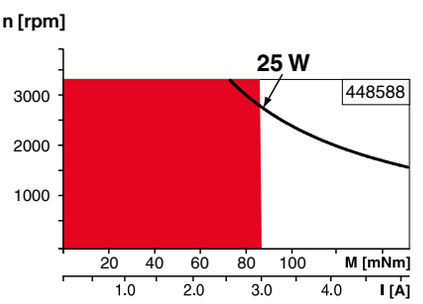
Other specifications

29	Number of pole pairs	1
30	Number of commutator segments	13
31	Weight of motor	480 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Option
Preloaded ball bearings

Operating Range



Comments

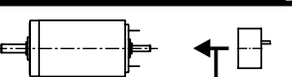
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 34



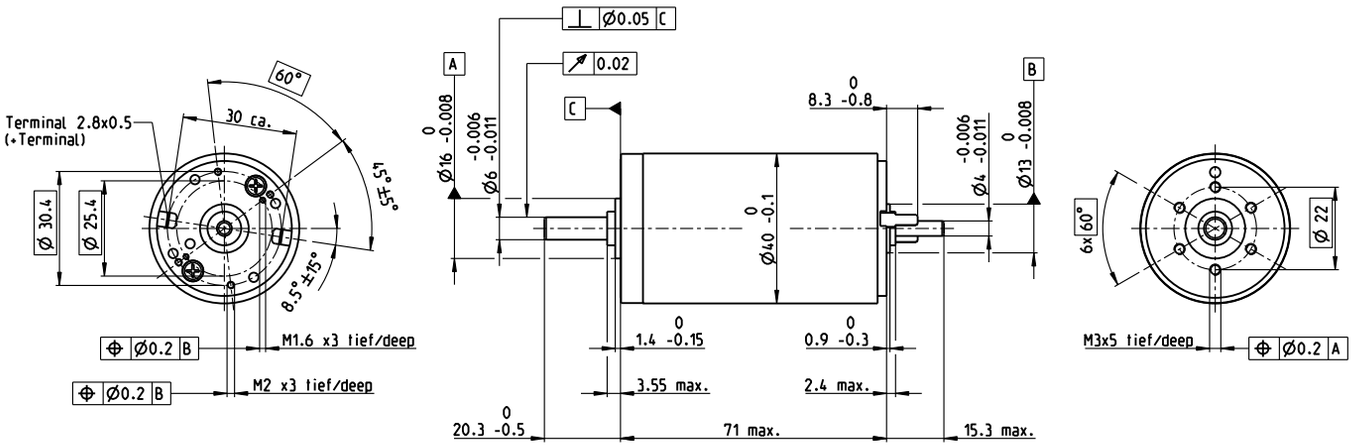
Recommended Electronics:

Notes	Page **34**
ESCON Module 24/2	486
ESCON 36/2 DC	486
ESCON Module 50/5	487
ESCON 50/5	489
EPOS4 Mod./Comp. 24/1.5	496
EPOS4 Mod./Comp. 50/5	496
EPOS4 50/5	501
EPOS2 P 24/5	504

Encoder MR
256 - 1024 CPT,
3 channels
Page 464

Encoder HED_ 5540
500 CPT,
3 channels
Page 471/474

RE 40 ∅40 mm, Graphite Brushes, 150 Watt



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

	148866	148867	148877	218008	218009	218010	218011	218012	218013	218014
Motor Data										
Values at nominal voltage										
1 Nominal voltage V	12	24	48	48	48	48	48	48	48	48
2 No load speed rpm	6920	7580	7590	6420	5560	3330	2690	2130	1720	1420
3 No load current mA	241	137	68.6	53.7	43.7	21.9	16.6	12.5	9.66	7.76
4 Nominal speed rpm	6380	6940	7000	5810	4930	2710	2060	1510	1080	781
5 Nominal torque (max. continuous torque) mNm	94.9	177	187	186	180	189	190	192	192	190
6 Nominal current (max. continuous current) A	6	6	3.17	2.66	2.23	1.4	1.13	0.909	0.73	0.6
7 Stall torque mNm	1720	2420	2560	2040	1620	1020	814	655	523	424
8 Stall current A	105	80.2	42.4	28.6	19.7	7.43	4.79	3.06	1.97	1.32
9 Max. efficiency %	88	91	92	91	91	89	89	88	86	85
Characteristics										
10 Terminal resistance Ω	0.115	0.299	1.13	1.68	2.44	6.46	10	15.7	24.4	36.3
11 Terminal inductance mH	0.024	0.082	0.33	0.46	0.613	1.7	2.62	4.14	6.41	9.32
12 Torque constant mNm/A	16.4	30.2	60.3	71.3	82.2	137	170	214	266	321
13 Speed constant rpm/V	581	317	158	134	116	69.7	56.2	44.7	35.9	29.8
14 Speed / torque gradient rpm/mNm	4.05	3.14	2.97	3.16	3.45	3.29	3.31	3.27	3.29	3.37
15 Mechanical time constant ms	5.89	4.67	4.28	4.2	4.19	4.16	4.15	4.15	4.15	4.16
16 Rotor inertia gcm^2	139	142	137	127	116	121	120	121	120	118

Specifications

Thermal data

17	Thermal resistance housing-ambient	4.7 K/W
18	Thermal resistance winding-housing	1.9 K/W
19	Thermal time constant winding	41.5 s
20	Thermal time constant motor	809 s
21	Ambient temperature	-30...+100°C
22	Max. winding temperature	+155°C

Mechanical data (ball bearings)

23	Max. speed	12000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	5.6 N
27	Max. force for press fits (static)	110 N
	(static, shaft supported)	1200 N
28	Max. radial load, 5 mm from flange	28 N

Other specifications

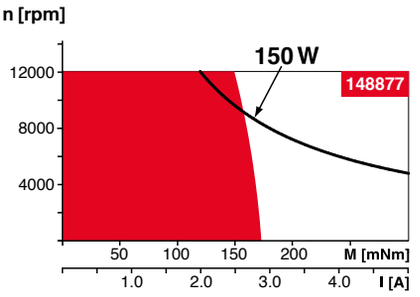
29	Number of pole pairs	1
30	Number of commutator segments	13
31	Weight of motor	480 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Option
Preloaded ball bearings

* Industrial version with radial shaft seal ring (resulting in increased no load current). IP54 protection only if mounted on brush side, in compliance with maxon modular system.

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

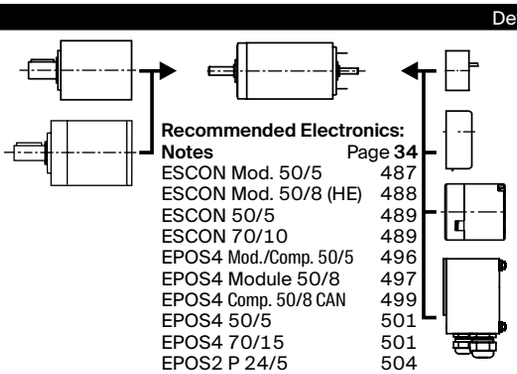
Assigned power rating

maxon Modular System

Details on catalog page 34

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 396

Planetary Gearhead
∅52 mm
4 - 30 Nm
Page 401



Recommended Electronics:

Notes	Page 34
ESCON Mod. 50/5	487
ESCON Mod. 50/8 (HE)	488
ESCON 50/5	489
ESCON 70/10	489
EPOS4 Mod./Comp. 50/5	496
EPOS4 Module 50/8	497
EPOS4 Comp. 50/8 CAN	499
EPOS4 50/5	501
EPOS4 70/15	501
EPOS2 P 24/5	504

Encoder MR
256 - 1024 CPT,
3 channels
Page 464

Encoder HED_ 5540
500 CPT,
3 channels
Page 471/474

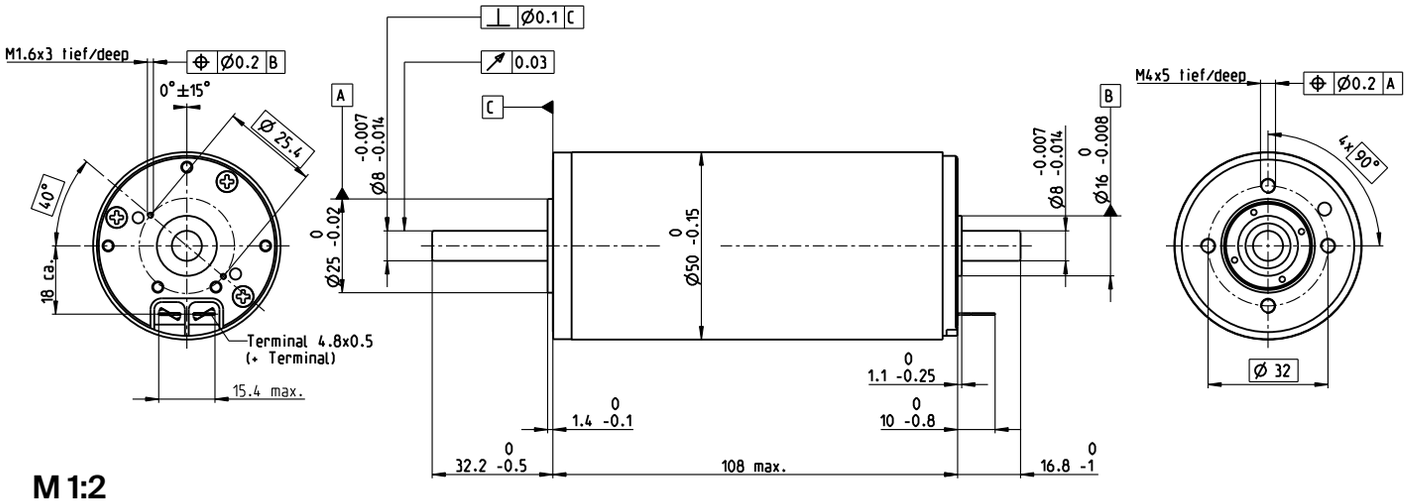
Brake AB 28
24 VDC
0.4 Nm
Page 519

Industrial Version IP54*
Encoder HEDL 9140
Page 478

Brake AB 28
Page 520

End cap
Page 525

RE 50 ∅50 mm, Graphite Brushes, 200 Watt



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers				
	578296	578297	**578298**	578299
Industrial Version IP54*	618570	618571	618572	618573

Motor Data						
	Values at nominal voltage					
1	Nominal voltage	V	24	36	48	70
2	No load speed	rpm	5950	5680	4900	2760
3	No load current	mA	236	147	88.4	27.4
4	Nominal speed	rpm	5680	5420	4620	2470
5	Nominal torque (max. continuous torque)	mNm	405	418	420	452
6	Nominal current (max. continuous current)	A	10.8	7.07	4.58	1.89
7	Stall torque	mNm	8920	8920	7370	4340
8	Stall current	A	232	148	78.9	17.9
9	Max. efficiency	%	94	94	94	92
	Characteristics					
10	Terminal resistance	Ω	0.103	0.244	0.608	3.9
11	Terminal inductance	mH	0.072	0.177	0.423	2.83
12	Torque constant	mNm/A	38.5	60.4	93.4	242
13	Speed constant	rpm/V	248	158	102	39.5
14	Speed / torque gradient	rpm/mNm	0.668	0.638	0.666	0.638
15	Mechanical time constant	ms	3.75	3.74	3.78	3.74
16	Rotor inertia	gcm²	536	560	542	560

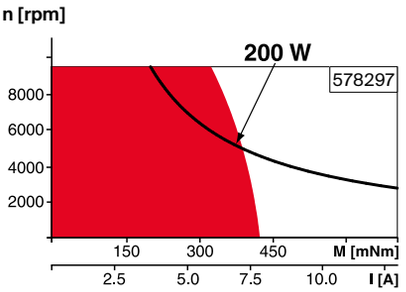
Specifications

	Thermal data		
17	Thermal resistance housing-ambient		3.8 K/W
18	Thermal resistance winding-housing		1.2 K/W
19	Thermal time constant winding		71.7 s
20	Thermal time constant motor		1370 s
21	Ambient temperature		-30...+100°C
22	Max. winding temperature		+125°C
	Mechanical data		
	(preloaded ball bearings)		
23	Max. speed		9500 rpm
24	Axial play at axial load	< 11.5 N	0 mm
		> 11.5 N	0.1 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		30 N
27	Max. force for press fits (static)		150 N
	(static, shaft supported)		6000 N
28	Max. radial load, 15 mm from flange		110 N
	Other specifications		
29	Number of pole pairs		1
30	Number of commutator segments		15
31	Weight of motor		1100 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

* Industrial version with radial shaft seal ring (resulting in increased no load current). IP54 protection only if mounted on brush side, in compliance with maxon modular system.

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

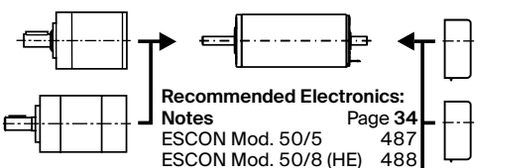
Assigned power rating

maxon Modular System

Details on catalog page 34

Planetary Gearhead
∅52 mm
4 - 30 Nm
Page 401

Planetary Gearhead
∅62 mm
8 - 50 Nm
Page 403



Recommended Electronics:

Notes	Page **34**
ESCON Mod. 50/5	487
ESCON Mod. 50/8 (HE)	488
ESCON 50/5	489
ESCON 70/10	489
EPOS4 Mod./Comp. 50/5	496
EPOS4 Module 50/8	497
EPOS4 Module 50/15	497
EPOS4 Comp. 50/8 CAN	499
EPOS4 Comp. 50/15 CAN	500
EPOS4 50/5	501
EPOS4 70/15	501

Encoder HEDS 5540
500 CPT,
3 channels
Page 472

Encoder HEDL 5540
500 CPT,
3 channels
Page 474

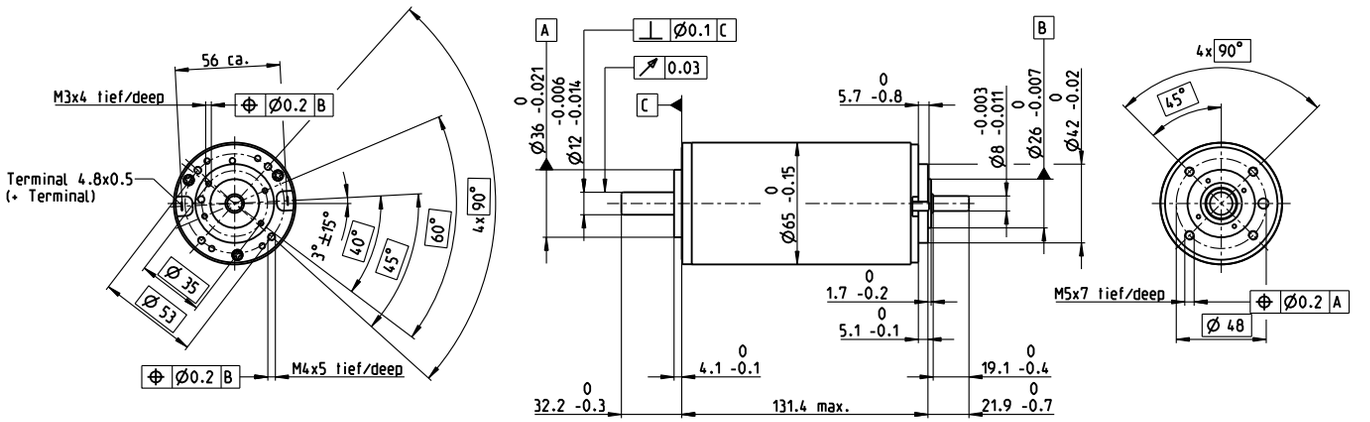
Industrial Version IP54*

Encoder HEDL 9140
Page 479

Brake AB 44
Page 524

End cap
Page 525

RE 65 ∅65 mm, Graphite Brushes, 250 Watt



M 1:4

Stock program
Standard program
Special program (on request)

Part Numbers

	353294	**353295**	353296	**353297**	353298	353299	353300	353301
Industrial Version IP54*	388984	388985	388986	388987	388988	388989	388990	388991
Motor Data								
Values at nominal voltage								
1 Nominal voltage	V	18	24	36	48	60	70	70	70
2 No load speed	rpm	3520	4090	3970	3670	3680	3440	3190	2690
3 No load current	mA	755	697	437	289	231	179	160	125
4 Nominal speed	rpm	3250	3810	3700	3420	3450	3220	2960	2470
5 Nominal torque (max. continuous torque)	mNm	427	501	751	800	813	832	839	888
6 Nominal current (max. continuous current)	A	10	10	9.32	6.8	5.53	4.51	4.21	3.74
7 Stall torque	mNm	13600	15700	17400	16100	16200	15100	13700	12200
8 Stall current	A	295	292	207	131	106	78.6	66.1	49.7
9 Max. efficiency	%	81	83	87	88	89	89	89	89
Characteristics								
10 Terminal resistance	Ω	0.0609	0.0821	0.174	0.365	0.568	0.891	1.06	1.41
11 Terminal inductance	mH	0.023	0.031	0.076	0.161	0.251	0.393	0.458	0.644
12 Torque constant	mNm/A	46	53.7	84.4	123	153	192	207	245
13 Speed constant	rpm/V	208	178	113	77.8	62.3	49.8	46.1	38.9
14 Speed / torque gradient	rpm/mNm	0.275	0.272	0.234	0.231	0.231	0.231	0.236	0.223
15 Mechanical time constant	ms	3.98	3.68	3.38	3.25	3.19	3.16	3.16	3.13
16 Rotor inertia	gcm²	1380	1290	1380	1340	1320	1310	1280	1340

Specifications

Thermal data

17	Thermal resistance housing-ambient	1.3 K/W
18	Thermal resistance winding-housing	1.85 K/W
19	Thermal time constant winding	123 s
20	Thermal time constant motor	1060 s
21	Ambient temperature	-30...+100°C
22	Max. winding temperature	+125°C

Mechanical data
(preloaded ball bearings)

23	Max. speed		5500 rpm
24	Axial play at axial load	< 25 N	0 mm
		> 25 N	0.1 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		70 N
27	Max. force for press fits (static)		420 N
	(static, shaft supported)		12000 N
28	Max. radial load, 15 mm from flange		350 N

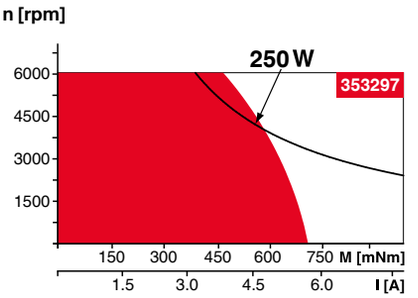
Other specifications

29	Number of pole pairs	2
30	Number of commutator segments	26
31	Weight of motor	2100 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

* Industrial version with radial shaft seal ring (resulting in increased no load current). IP54 protection only if mounted on brush side, in compliance with maxon modular system.

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

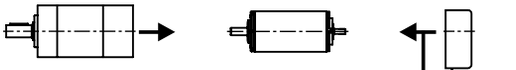
Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 34

Planetary Gearhead
∅81 mm
20 - 120 Nm
Page 404



Recommended Electronics:

Notes	Page **34**
ESCON Mod. 50/5	487
ESCON Mod. 50/8 (HE)	488
ESCON 50/5	489
ESCON 70/10	489
EPOS4 Module 50/8	497
EPOS4 Module 50/15	497
EPOS4 Comp. 50/8 CAN	499
EPOS4 Comp. 50/15 CAN	500
EPOS4 70/15	501

Encoder HEDS 5540
500 CPT,
3 channels
Page 472
Encoder HEDL 5540
500 CPT,
3 channels
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Industrial Version IP54*
Encoder HEDL 9140
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Brake AB 44
Page 524
End cap
Page 525

For your personal notes

maxon

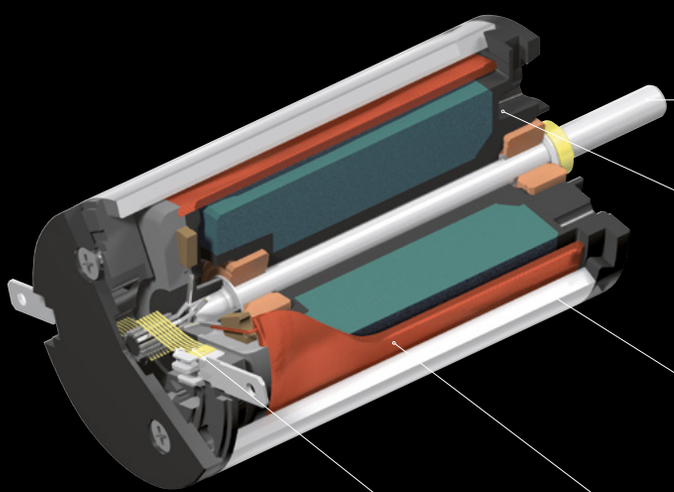
maxon A-max

maxon A-max

The drives use an ironless rotor and AlNiCo magnets. Automated manufacturing means that maxon's brushed A-max motors offer top performance at an attractive price. In maxon's modular system you can combine the A-max motors with gears, sensors and controllers for a complete drive system.

Key data

Motor ∅	12 ... 32 mm
Motor length	21.2 ... 62.9 mm
Power	0.5 ... 20 W
Nominal torque	up to 45.5 mNm
Max. permissible speed	up to 19 000 rpm



Torque-resistant shaft. No recesses; the stress concentration is eliminated.

In a hybrid process, a stator is formed by assembling the motor housing and magnet in one step using injection molding of PPA plastic. Sintered bearings or ball bearings.

Motor housing made of strip steel, produced with highest precision at low cost, with no waste.

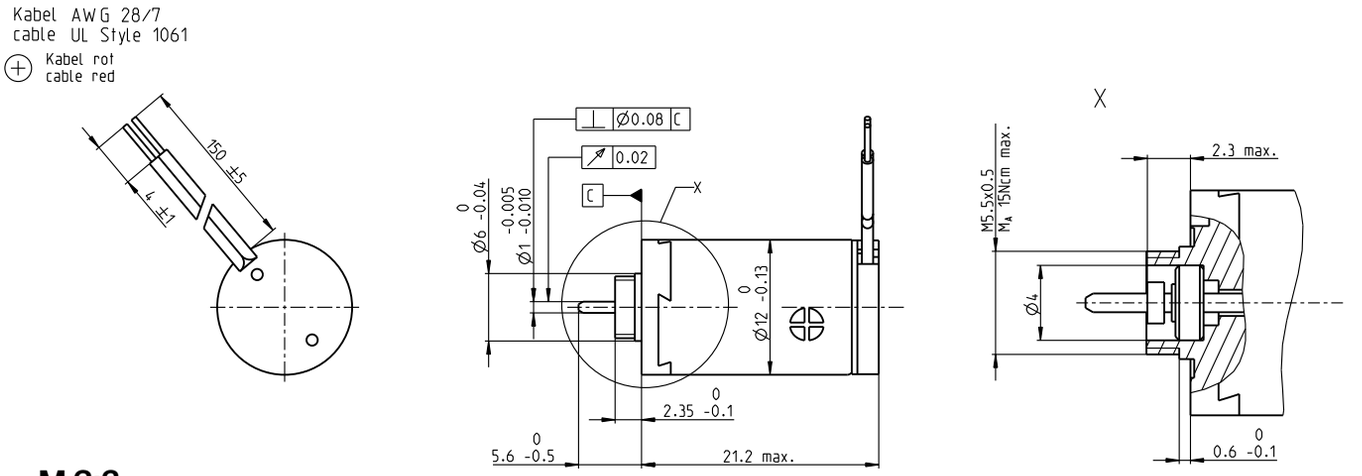
Proven winding procedure. Better performance resulting from optimal use of the air gap in the entire winding series.

4-, 5- or 7-fingered precious metal brushes for fine rotary motions. Graphite brushes for heavy-duty use.

- → Good price-performance ratio
- → DC motor with AlNiCo magnet
- → Torque-resistant shaft
- → Automated manufacturing process
- → Easily configured online

shop.maxongroup.com

A-max 12 ∅12 mm, Precious Metal Brushes CLL, 0.75 Watt



M 3:2

Stock program
Standard program
Special program (on request)

Part Numbers

		200937	265374	265375	265376	265377	265378
Motor Data							
	Values at nominal voltage						
1	Nominal voltage	V	3	4.5	6	9	12	15
2	No load speed	rpm	13900	11900	12800	12100	12300	13800
3	No load current	mA	21.1	11.5	9.47	5.87	4.5	4.2
4	Nominal speed	rpm	5980	4380	5260	4470	4610	5030
5	Nominal torque (max. continuous torque)	mNm	0.897	0.961	0.948	0.941	0.931	0.804
6	Nominal current (max. continuous current)	A	0.465	0.282	0.225	0.141	0.107	0.0836
7	Stall torque	mNm	1.58	1.55	1.63	1.52	1.52	1.29
8	Stall current	A	0.789	0.438	0.374	0.22	0.168	0.129
9	Max. efficiency	%	70	71	71	70	70	68
	Characteristics							
10	Terminal resistance	Ω	3.8	10.3	16	40.9	71.6	116
11	Terminal inductance	mH	0.085	0.264	0.403	1.01	1.74	2.13
12	Torque constant	mNm/A	2.01	3.53	4.36	6.92	9.06	10
13	Speed constant	rpm/V	4760	2710	2190	1380	1050	952
14	Speed / torque gradient	rpm/mNm	9030	7880	8060	8170	8330	11000
15	Mechanical time constant	ms	20.6	20.3	20.4	20.4	20.5	21.1
16	Rotor inertia	gcm²	0.218	0.246	0.241	0.238	0.235	0.183

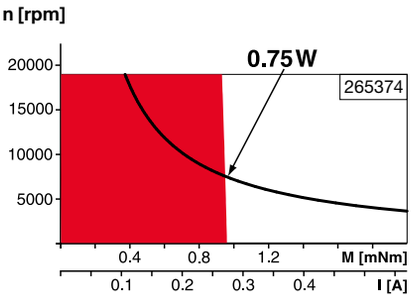
Specifications

	Thermal data	
17	Thermal resistance housing-ambient	44.5 K/W
18	Thermal resistance winding-housing	15 K/W
19	Thermal time constant winding	5.03 s
20	Thermal time constant motor	245 s
21	Ambient temperature	-30...+65°C
22	Max. winding temperature	+85°C
	Mechanical data (sleeve bearings)	
23	Max. speed	19 000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	0.15 N
27	Max. force for press fits (static)	15 N
28	Max. radial load, 4 mm from flange	0.4 N
	Other specifications	
29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	11 g

CLL = Capacitor Long Life
Alignment of the electronic connections not specified.

Values listed in the table are nominal.
Explanation of the figures on page 72.

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

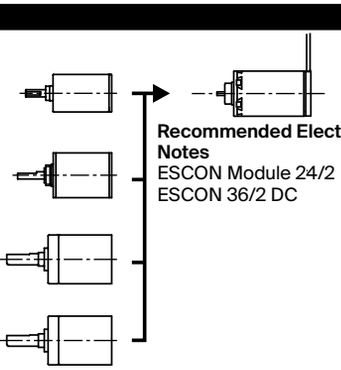
Details on catalog page 34

Planetary Gearhead
∅10 mm
0.01 - 0.15 Nm
Page 361

Spur Gearhead
∅12 mm
0.01 - 0.03 Nm
Page 362

Planetary Gearhead
∅13 mm
0.05 - 0.15 Nm
Page 363

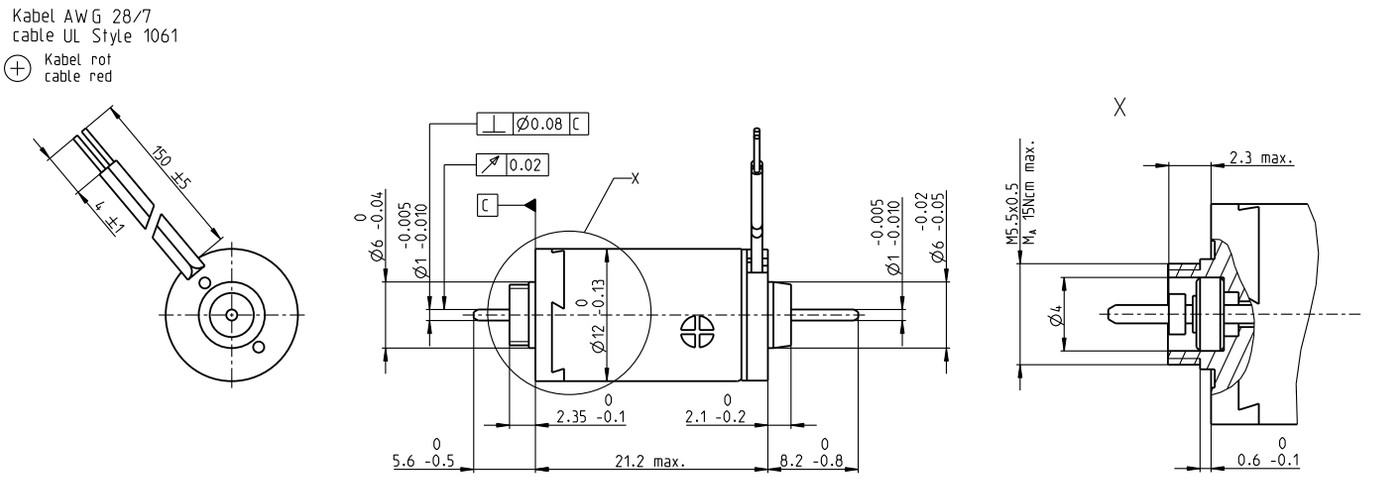
Planetary Gearhead
∅13 mm
0.2 - 0.35 Nm
Page 364



Recommended Electronics:

Notes	Page 34
ESCON Module 24/2	486
ESCON 36/2 DC	486

A-max 12 ∅12 mm, Precious Metal Brushes CLL, 0.5 Watt



M 3:2

Stock program
Standard program
Special program (on request)

Part Numbers

			200938	265389	265390	265391	265392	265393
Motor Data								
	Values at nominal voltage							
1	Nominal voltage	V	3	4.5	6	9	12	15
2	No load speed	rpm	13700	11700	12600	11900	12100	13500
3	No load current	mA	34.5	18.8	15.5	9.63	7.38	6.88
4	Nominal speed	rpm	6000	4390	5280	4480	4620	5050
5	Nominal torque (max. continuous torque)	mNm	0.872	0.937	0.923	0.918	0.908	0.78
6	Nominal current (max. continuous current)	A	0.464	0.282	0.225	0.141	0.106	0.0835
7	Stall torque	mNm	1.58	1.55	1.63	1.52	1.52	1.29
8	Stall current	A	0.789	0.438	0.374	0.22	0.168	0.129
9	Max. efficiency	%	63	63	64	63	63	60
	Characteristics							
10	Terminal resistance	Ω	3.8	10.3	16	40.9	71.6	116
11	Terminal inductance	mH	0.085	0.264	0.403	1.01	1.74	2.13
12	Torque constant	mNm/A	2.01	3.53	4.36	6.92	9.06	10
13	Speed constant	rpm/V	4760	2710	2190	1380	1050	952
14	Speed / torque gradient	rpm/mNm	9030	7880	8060	8170	8330	11000
15	Mechanical time constant	ms	20.6	20.3	20.4	20.4	20.5	21.1
16	Rotor inertia	gcm²	0.218	0.246	0.241	0.238	0.235	0.183

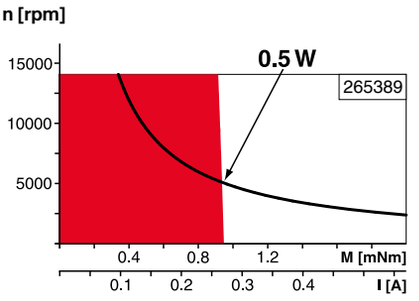
Specifications

	Thermal data	
17	Thermal resistance housing-ambient	44.5 K/W
18	Thermal resistance winding-housing	15 K/W
19	Thermal time constant winding	5.03 s
20	Thermal time constant motor	267 s
21	Ambient temperature	-30...+65°C
22	Max. winding temperature	+85°C
	Mechanical data (sleeve bearings)	
23	Max. speed	14000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	0.15 N
27	Max. force for press fits (static)	15 N
	(static, shaft supported)	70 N
28	Max. radial load, 4 mm from flange	0.4 N
	Other specifications	
29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	12 g

CLL = Capacitor Long Life
Alignment of the electronic connections not specified.

Values listed in the table are nominal.
Explanation of the figures on page 72.

Operating Range



Comments

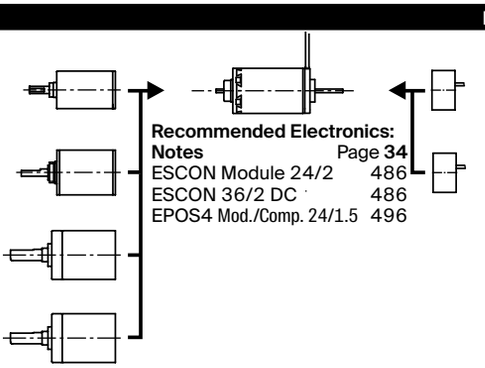
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 34



Planetary Gearhead
∅10 mm
0.01 - 0.15 Nm
Page 361

Spur Gearhead
∅12 mm
0.01 - 0.03 Nm
Page 362

Planetary Gearhead
∅13 mm
0.05 - 0.15 Nm
Page 363

Planetary Gearhead
∅13 mm
0.2 - 0.35 Nm
Page 364

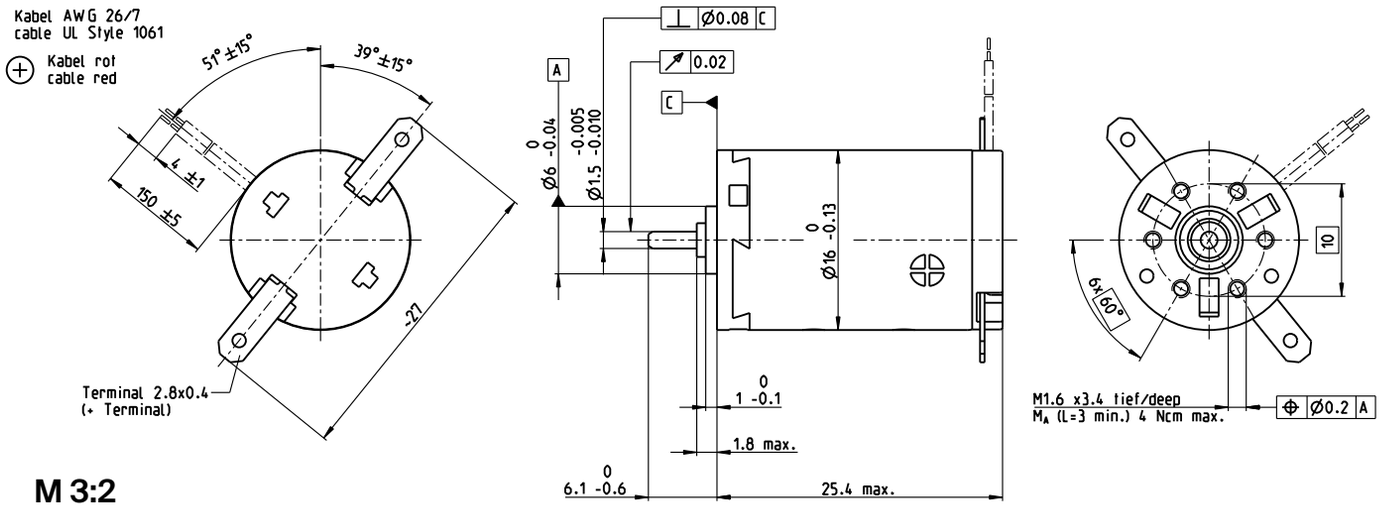
Recommended Electronics:

Notes	Page 34
ESCON Module 24/2	486
ESCON 36/2 DC	486
EPOS4 Mod./Comp. 24/1.5	496

Encoder MR
16 CPT,
2 channels
Page 457

Encoder MR
64 - 256 CPT,
2 channels
Page 458

A-max 16 ∅16 mm, Precious Metal Brushes CLL, 2 Watt



M 3:2

Stock program
Standard program
Special program (on request)

Part Numbers

with terminals	110041	110042	110043	110044	**110045**	110046	110047	110048	**110049**	110050
with cables	139820	352815	134844	231379	220514	304672	352823	352816	260678	352817

Motor Data

	Values at nominal voltage											
1	Nominal voltage	V	1.5	3	6	9	12	15	18	21	24	30
2	No load speed	rpm	10800	11000	10100	12300	12300	13200	14100	13700	13800	11400
3	No load current	mA	61.4	38.1	13.9	12.7	9.54	8.57	7.99	6.53	5.83	3.37
4	Nominal speed	rpm	9360	8810	4530	6700	6660	7590	8480	8040	8120	5480
5	Nominal torque (max. continuous torque)	mNm	0.712	1.3	2.22	2.19	2.17	2.17	2.15	2.14	2.11	2.08
6	Nominal current (max. continuous current)	A	0.6	0.6	0.408	0.327	0.243	0.209	0.185	0.153	0.134	0.0864
7	Stall torque	mNm	4.79	4.51	4.03	4.82	4.77	5.16	5.44	5.22	5.12	4.04
8	Stall current	A	3.66	1.97	0.723	0.702	0.52	0.482	0.453	0.362	0.315	0.164
9	Max. efficiency	%	76	75	75	76	76	76	76	76	76	74
	Characteristics											
10	Terminal resistance	Ω	0.41	1.52	8.3	12.8	23.1	31.1	39.7	57.9	76.2	183
11	Terminal inductance	mH	0.017	0.052	0.306	0.467	0.83	1.13	1.42	2.05	2.61	6.01
12	Torque constant	mNm/A	1.31	2.29	5.57	6.88	9.17	10.7	12	14.4	16.3	24.7
13	Speed constant	rpm/V	7290	4170	1720	1390	1040	893	795	663	587	387
14	Speed / torque gradient	rpm/mNm	2280	2770	2560	2590	2620	2600	2630	2670	2750	2880
15	Mechanical time constant	ms	25.3	23.8	23.2	23.3	23.3	23.4	23.5	23.4	23.5	23.9
16	Rotor inertia	gcm²	1.06	0.82	0.868	0.859	0.849	0.859	0.852	0.838	0.816	0.793

Specifications

Thermal data

17	Thermal resistance housing-ambient	29.8 K/W
18	Thermal resistance winding-housing	5.5 K/W
19	Thermal time constant winding	3.55 s
20	Thermal time constant motor	165 s
21	Ambient temperature	-30...+65°C
22	Max. winding temperature	+85°C

Mechanical data (sleeve bearings)

23	Max. speed	19 000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static)	35 N
28	Max. radial load, 5 mm from flange	1.4 N

Mechanical data (ball bearings)

23	Max. speed	19 000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	2.2 N
27	Max. force for press fits (static)	30 N
28	Max. radial load, 5 mm from flange	7.8 N

Other specifications

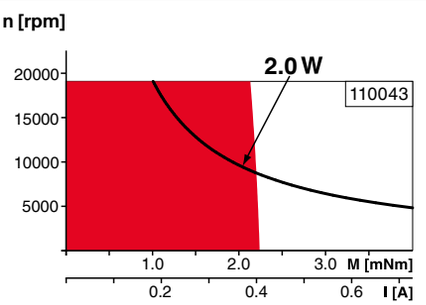
29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	21 g

CLL = Capacitor Long Life

Values listed in the table are nominal.
Explanation of the figures on page 72.

Option
Ball bearings in place of sleeve bearings
Without CLL

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

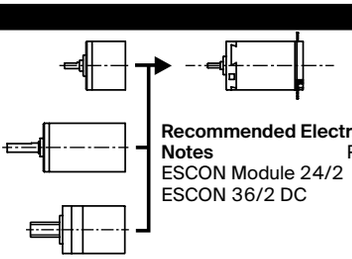
maxon Modular System

Details on catalog page 34

Spur Gearhead
∅16 mm
0.01 - 0.1 Nm
Page 365–368

Planetary Gearhead
∅16 mm
0.1 - 0.6 Nm
Page 369/370

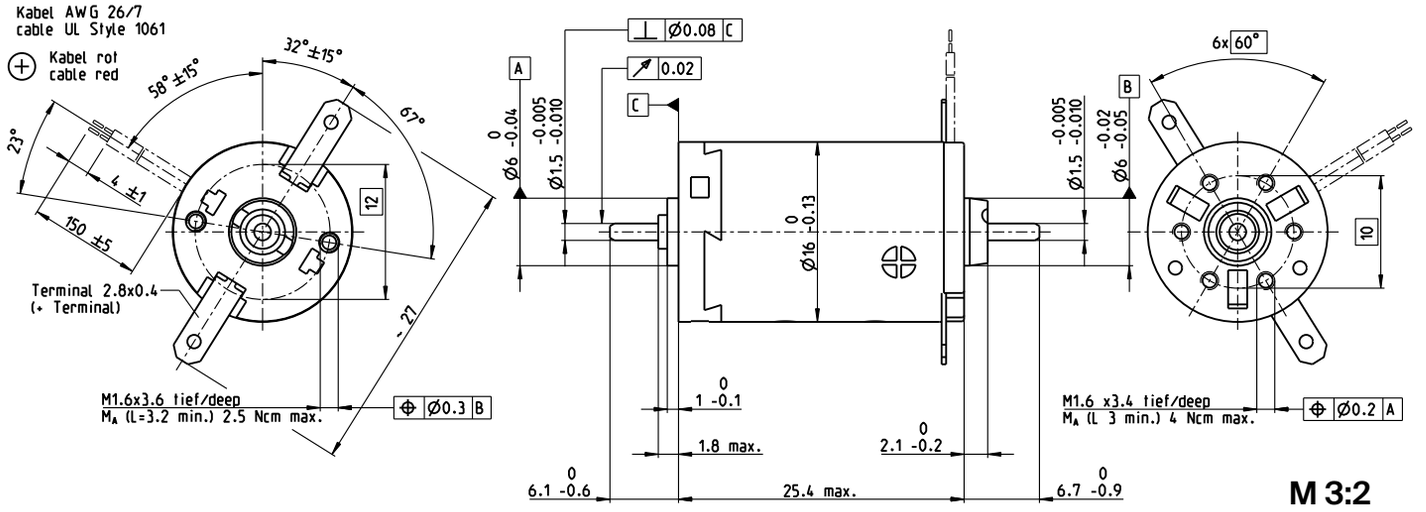
Screw Drive
∅16 mm
Page 411–413



Recommended Electronics:

Notes	Page **34**
ESCON Module 24/2	486
ESCON 36/2 DC	486

A-max 16 ∅16 mm, Precious Metal Brushes CLL, 1.2 Watt



Stock program
Standard program
Special program (on request)

Part Numbers

with terminals	110051	110052	110053	110054	110055	**110056**	110057	110058	110059	110060	
with cables	139823	352825	352826	352827	352828	352829	352830	352831	352832	352833	

Motor Data												
	Values at nominal voltage											
1	Nominal voltage	V	1.2	2.4	6	7.2	9	12	15	18	18	30
2	No load speed	rpm	8560	9730	10000	9740	9120	10400	11600	11600	10300	11300
3	No load current	mA	73.9	44.1	18.3	14.7	10.8	9.69	8.99	7.49	6.34	4.33
4	Nominal speed	rpm	7170	6310	4540	4200	3530	4900	6090	6050	4580	5500
5	Nominal torque (max. continuous torque)	mNm	0.694	1.29	2.18	2.17	2.16	2.16	2.13	2.12	2.09	2.04
6	Nominal current (max. continuous current)	A	0.6	0.6	0.407	0.327	0.244	0.21	0.185	0.153	0.134	0.0862
7	Stall torque	mNm	3.83	3.61	4.03	3.86	3.57	4.13	4.54	4.48	3.84	4.04
8	Stall current	A	2.93	1.58	0.723	0.561	0.39	0.386	0.378	0.311	0.236	0.164
9	Max. efficiency	%	71	70	71	71	70	71	72	72	71	71
	Characteristics											
10	Terminal resistance	Ω	0.41	1.52	8.3	12.8	23.1	31.1	39.7	57.9	76.2	183
11	Terminal inductance	mH	0.017	0.0519	0.306	0.467	0.831	1.13	1.42	2.05	2.61	6.01
12	Torque constant	mNm/A	1.31	2.29	5.57	6.88	9.17	10.7	12	14.4	16.3	24.7
13	Speed constant	rpm/V	7290	4170	1720	1390	1040	893	795	663	587	387
14	Speed / torque gradient	rpm/mNm	2280	2770	2560	2590	2620	2600	2630	2670	2750	2880
15	Mechanical time constant	ms	25.3	23.7	23.2	23.3	23.3	23.3	23.4	23.3	23.4	23.8
16	Rotor inertia	gcm²	1.06	0.818	0.866	0.857	0.847	0.857	0.85	0.836	0.814	0.791

Specifications

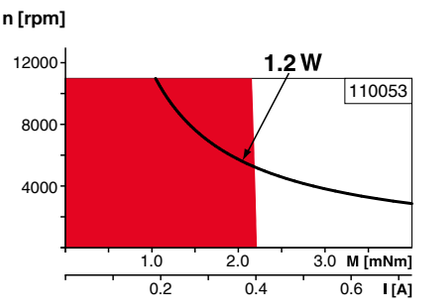
	Thermal data	
17	Thermal resistance housing-ambient	29.8 K/W
18	Thermal resistance winding-housing	5.5 K/W
19	Thermal time constant winding	3.55 s
20	Thermal time constant motor	165 s
21	Ambient temperature	-30...+65°C
22	Max. winding temperature	+85°C
	Mechanical data (sleeve bearings)	
23	Max. speed	11000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static)	35 N
	(static, shaft supported)	280 N
28	Max. radial load, 5 mm from flange	1.4 N
	Mechanical data (ball bearings)	
23	Max. speed	11000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	2.2 N
27	Max. force for press fits (static)	30 N
	(static, shaft supported)	280 N
28	Max. radial load, 5 mm from flange	7.8 N
	Other specifications	
29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	22 g

CLL = Capacitor Long Life

Values listed in the table are nominal.
Explanation of the figures on page 72.

Option
Ball bearings in place of sleeve bearings
Without CLL

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

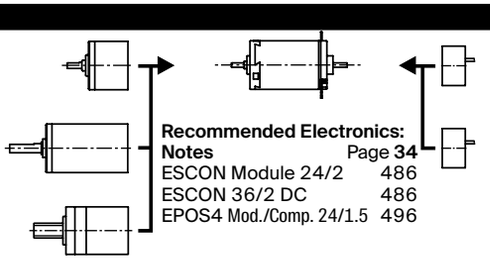
maxon Modular System

Details on catalog page 34

Spur Gearhead
∅16 mm
0.01 - 0.1 Nm
Page 365–368

Planetary Gearhead
∅16 mm
0.1 - 0.6 Nm
Page 369/370

Screw Drive
∅16 mm
Page 411–413



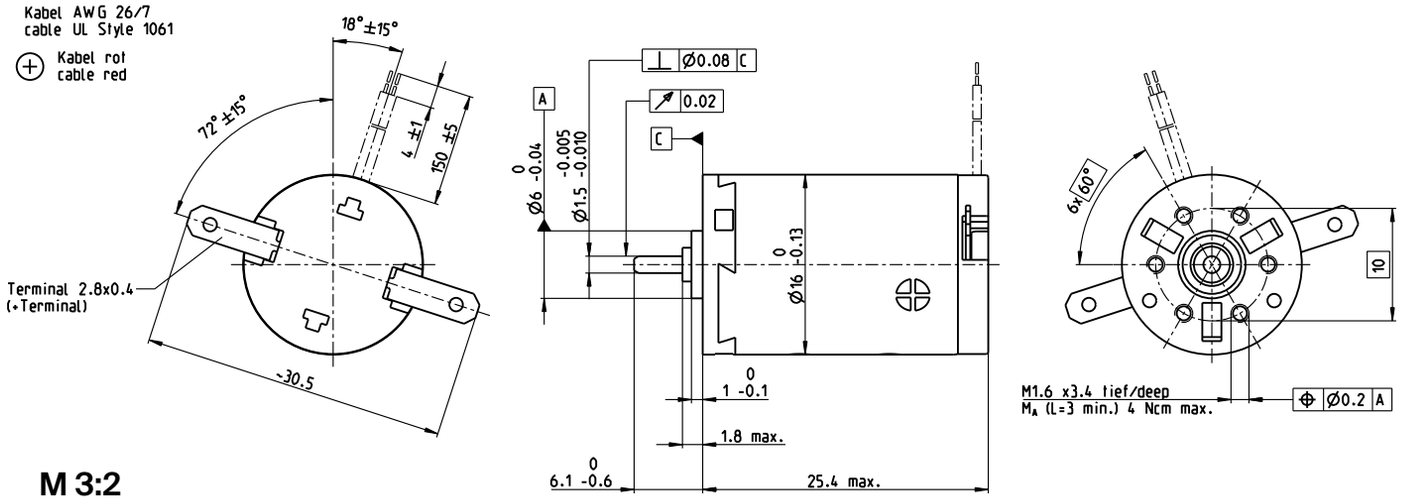
Recommended Electronics:

Notes	Page **34**
ESCON Module 24/2	486
ESCON 36/2 DC	486
EPOS4 Mod./Comp. 24/1.5	496

Encoder MR
32 CPT,
2 / 3 channels
Page 460

Encoder MR
128 / 256 / 512 CPT,
2 / 3 channels
Page 461

A-max 16 ∅16 mm, Graphite Brushes, 2 Watt



Stock program
Standard program
Special program (on request)

Part Numbers

with terminals	110061	110062	110063	110064	110065	110066	110067	110068	**110069**	110070
with cables	139821	352853	352854	352855	325083	352856	205903	352857	266076	352858

Motor Data											
Values at nominal voltage											
1 Nominal voltage	V	1.5	3	6	9	12	14	15	18	21	30
2 No load speed	rpm	10200	11500	9360	11500	11500	11500	11000	10900	11300	10500
3 No load current	mA	282	164	65.6	54.6	41	35.1	31.1	25.9	23	15
4 Nominal speed	rpm	9010	8060	3280	5510	5460	5500	4860	4810	5100	4180
5 Nominal torque (max. continuous torque)	mNm	0.579	1.29	2.42	2.36	2.34	2.35	2.35	2.33	2.28	2.24
6 Nominal current (max. continuous current)	A	0.72	0.72	0.495	0.394	0.293	0.253	0.224	0.186	0.162	0.105
7 Stall torque	mNm	5.36	4.65	4.05	4.84	4.78	4.82	4.54	4.48	4.49	4.04
8 Stall current	A	4.1	2.03	0.727	0.704	0.521	0.451	0.378	0.311	0.276	0.164
9 Max. efficiency	%	54	51	49	52	52	52	51	51	50	48
Characteristics											
10 Terminal resistance	Ω	0.366	1.48	8.25	12.8	23	31.1	39.7	57.9	76.1	183
11 Terminal inductance	mH	0.017	0.052	0.306	0.467	0.83	1.13	1.42	2.05	2.61	6.01
12 Torque constant	mNm/A	1.31	2.29	5.57	6.88	9.17	10.7	12	14.4	16.3	24.7
13 Speed constant	rpm/V	7290	4170	1720	1390	1040	893	795	663	587	387
14 Speed / torque gradient	rpm/mNm	2040	2690	2540	2580	2620	2590	2630	2660	2750	2880
15 Mechanical time constant	ms	22.6	23.1	23.1	23.2	23.3	23.3	23.5	23.4	23.5	23.9
16 Rotor inertia	gcm²	1.06	0.82	0.868	0.859	0.849	0.859	0.852	0.838	0.816	0.793

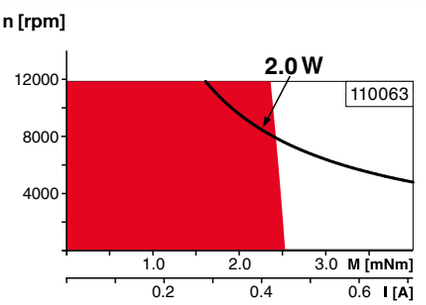
Specifications

Thermal data		
17	Thermal resistance housing-ambient	29.8 K/W
18	Thermal resistance winding-housing	5.5 K/W
19	Thermal time constant winding	3.55 s
20	Thermal time constant motor	165 s
21	Ambient temperature	-30...+85°C
22	Max. winding temperature	+125°C
Mechanical data (sleeve bearings)		
23	Max. speed	11900 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static)	35 N
28	Max. radial load, 5 mm from flange	1.4 N
Mechanical data (ball bearings)		
23	Max. speed	11900 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	2.2 N
27	Max. force for press fits (static)	30 N
28	Max. radial load, 5 mm from flange	7.8 N
Other specifications		1
29	Number of pole pairs	7
30	Number of commutator segments	21 g
31	Weight of motor	

Values listed in the table are nominal.
Explanation of the figures on page 72.

Option
Ball bearings in place of sleeve bearings

Operating Range



Comments

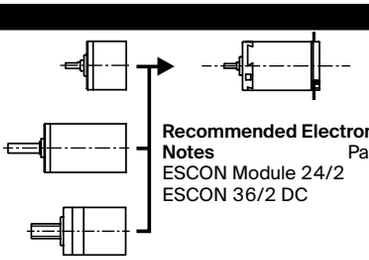
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 34



Spur Gearhead
∅16 mm
0.01 - 0.1 Nm
Page 365–368

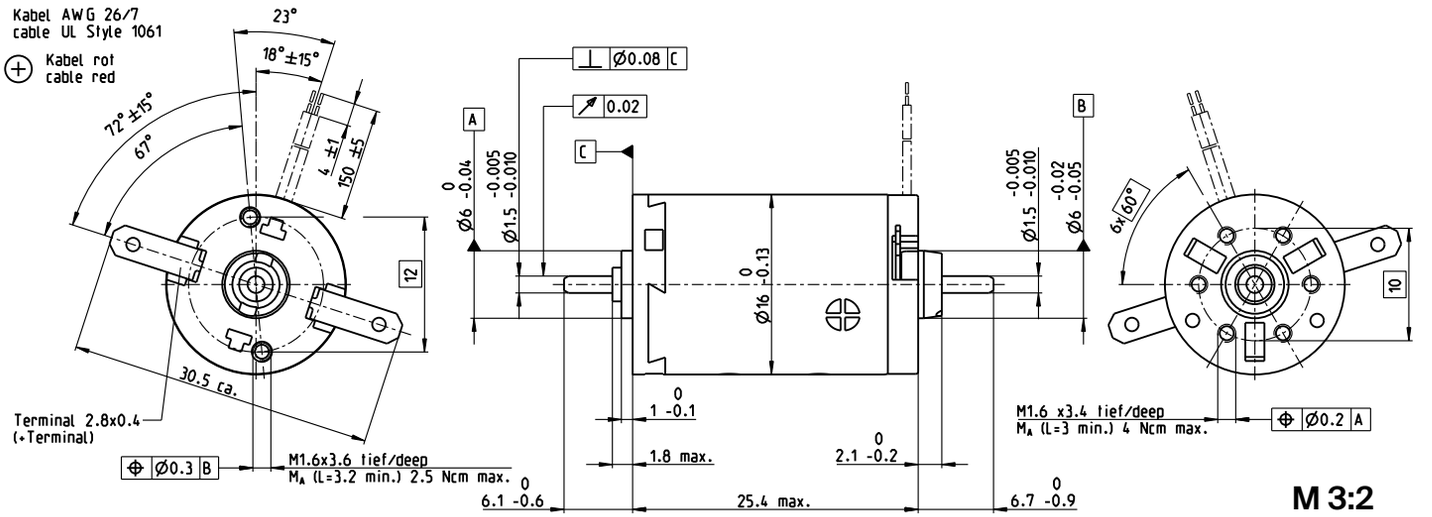
Planetary Gearhead
∅16 mm
0.1 - 0.6 Nm
Page 369/370

Screw Drive
∅16 mm
Page 411–413

Recommended Electronics:

Notes	Page **34**
ESCON Module 24/2	486
ESCON 36/2 DC	486

A-max 16 ∅16 mm, Graphite Brushes, 2 Watt



Stock program
Standard program
Special program (on request)

Part Numbers

with terminals	110071	110072	110073	110074	110075	110076	110077	110078	110079	110080
with cables	139825	352870	352871	352872	352873	352874	352875	352876	352877	352878

Motor Data											
	Values at nominal voltage										
1	Nominal voltage	V	1.5	3	6	9	12	14	15	18	21	30
2	No load speed	rpm	10200	11500	9360	11500	11500	11500	11000	10900	11300	10500
3	No load current	mA	282	164	65.6	54.6	41	35.1	31.1	25.9	23	15
4	Nominal speed	rpm	9010	8060	3280	5510	5460	5500	4860	4810	5100	4180
5	Nominal torque (max. continuous torque)	mNm	0.579	1.29	2.42	2.36	2.34	2.35	2.35	2.33	2.28	2.24
6	Nominal current (max. continuous current)	A	0.72	0.72	0.495	0.394	0.293	0.253	0.224	0.186	0.162	0.105
7	Stall torque	mNm	5.36	4.65	4.05	4.84	4.78	4.82	4.54	4.48	4.49	4.04
8	Stall current	A	4.1	2.03	0.727	0.704	0.521	0.451	0.378	0.311	0.276	0.164
9	Max. efficiency	%	54	51	49	52	52	52	51	51	50	48
	Characteristics										
10	Terminal resistance	Ω	0.366	1.48	8.25	12.8	23	31.1	39.7	57.9	76.1	183
11	Terminal inductance	mH	0.017	0.052	0.306	0.467	0.83	1.13	1.42	2.05	2.61	6.01
12	Torque constant	mNm/A	1.31	2.29	5.57	6.88	9.17	10.7	12	14.4	16.3	24.7
13	Speed constant	rpm/V	7290	4170	1720	1390	1040	893	795	663	587	387
14	Speed / torque gradient	rpm/mNm	2040	2690	2540	2580	2620	2590	2630	2660	2750	2880
15	Mechanical time constant	ms	22.6	23.1	23.1	23.2	23.3	23.3	23.5	23.4	23.5	23.9
16	Rotor inertia	gcm²	1.06	0.82	0.868	0.859	0.849	0.859	0.852	0.838	0.816	0.793

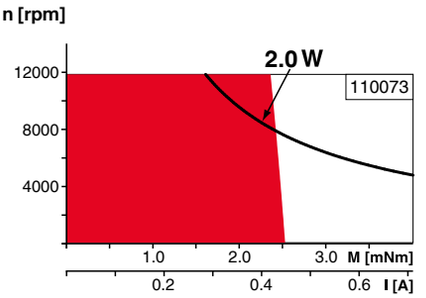
Specifications

	Thermal data	
17	Thermal resistance housing-ambient	29.8 K/W
18	Thermal resistance winding-housing	5.5 K/W
19	Thermal time constant winding	3.55 s
20	Thermal time constant motor	165 s
21	Ambient temperature	-30...+85°C
22	Max. winding temperature	+125°C
	Mechanical data (sleeve bearings)	
23	Max. speed	11900 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static)	35 N
	(static, shaft supported)	280 N
28	Max. radial load, 5 mm from flange	1.4 N
	Mechanical data (ball bearings)	
23	Max. speed	11900 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	2.2 N
27	Max. force for press fits (static)	30 N
	(static, shaft supported)	280 N
28	Max. radial load, 5 mm from flange	7.8 N
	Other specifications	
29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	22 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Option
Ball bearings in place of sleeve bearings

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

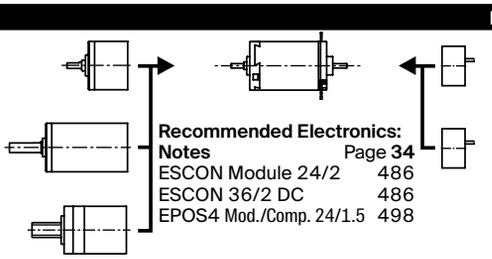
maxon Modular System

Details on catalog page 34

Spur Gearhead
∅16 mm
0.01 - 0.1 Nm
Page 365–368

Planetary Gearhead
∅16 mm
0.1 - 0.6 Nm
Page 369/370

Screw Drive
∅16 mm
Page 411–413



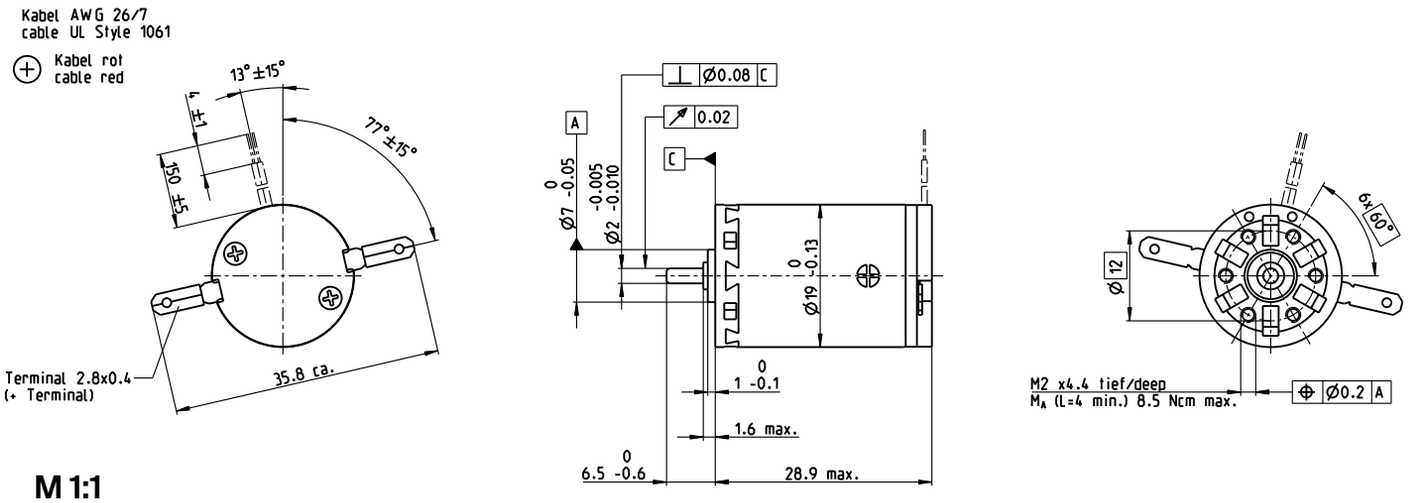
Recommended Electronics:

Notes	Page 34
ESCON Module 24/2	486
ESCON 36/2 DC	486
EPOS4 Mod./Comp. 24/1.5	498

Encoder MR
32 CPT,
2 / 3 channels
Page 460

Encoder MR
128 / 256 / 512 CPT,
2 / 3 channels
Page 461

A-max 19 ∅19 mm, Precious Metal Brushes CLL, 2.5 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers									
with terminals	110081	110082	110083	110084	110085	110086	110087	110088	110089
with cables	139828	202411	352922	202412	352923	233453	238388	267427	235373

Motor Data										
	Values at nominal voltage									
1	Nominal voltage	V	1.5	3.6	4.5	6	9	12	15	18	24
2	No load speed	rpm	8040	10800	9420	7790	9220	10300	10300	9300	8870
3	No load current	mA	78	52.9	33.6	18.6	16.2	14.6	11.7	8.25	5.73
4	Nominal speed	rpm	6840	8080	5710	4000	5470	6510	6500	5380	4900
5	Nominal torque (max. continuous torque)	mNm	1.35	2.48	3.61	3.59	3.59	3.49	3.48	3.42	3.39
6	Nominal current (max. continuous current)	A	0.84	0.84	0.83	0.51	0.403	0.33	0.264	0.195	0.138
7	Stall torque	mNm	7.79	9.43	9	7.36	8.83	9.47	9.45	8.16	7.63
8	Stall current	A	4.44	3.02	2.01	1.02	0.963	0.867	0.692	0.45	0.301
9	Max. efficiency	%	76	76	76	76	76	76	76	76	75
	Characteristics									
10	Terminal resistance	Ω	0.338	1.19	2.24	5.88	9.34	13.8	21.7	40	79.7
11	Terminal inductance	mH	0.019	0.059	0.121	0.314	0.506	0.719	1.12	1.98	3.87
12	Torque constant	mNm/A	1.76	3.12	4.49	7.22	9.17	10.9	13.7	18.1	25.4
13	Speed constant	rpm/V	5440	3060	2130	1320	1040	874	699	526	377
14	Speed / torque gradient	rpm/mNm	1050	1170	1060	1080	1060	1110	1110	1160	1180
15	Mechanical time constant	ms	27.9	25.4	24.3	24.2	24.1	24.2	24.3	25	24.6
16	Rotor inertia	gcm²	2.54	2.07	2.18	2.14	2.16	2.09	2.09	2.06	1.99

Specifications

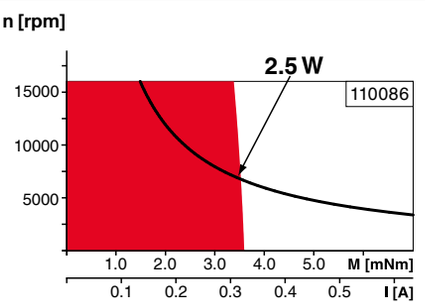
	Thermal data	
17	Thermal resistance housing-ambient	21.3 K/W
18	Thermal resistance winding-housing	10.5 K/W
19	Thermal time constant winding	11 s
20	Thermal time constant motor	201 s
21	Ambient temperature	-30...+65°C
22	Max. winding temperature	+85°C
	Mechanical data (sleeve bearings)	
23	Max. speed	16 000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	1 N
27	Max. force for press fits (static)	80 N
28	Max. radial load, 5 mm from flange	2.7 N
	Mechanical data (ball bearings)	
23	Max. speed	16 000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	3.3 N
27	Max. force for press fits (static)	45 N
28	Max. radial load, 5 mm from flange	11.9 N
	Other specifications	
29	Number of pole pairs	1
30	Number of commutator segments	9
31	Weight of motor	33 g

CLL = Capacitor Long Life

Values listed in the table are nominal.
Explanation of the figures on page 72.

Option
Ball bearings in place of sleeve bearings
Without CLL

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

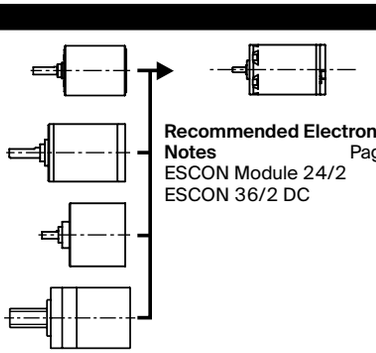
Details on catalog page 34

Planetary Gearhead
∅19 mm
0.1 - 0.3 Nm
Page 371

Planetary Gearhead
∅22 mm
0.5 - 2.0 Nm
Page 374/376

Spur Gearhead
∅24 mm
0.1 Nm
Page 380

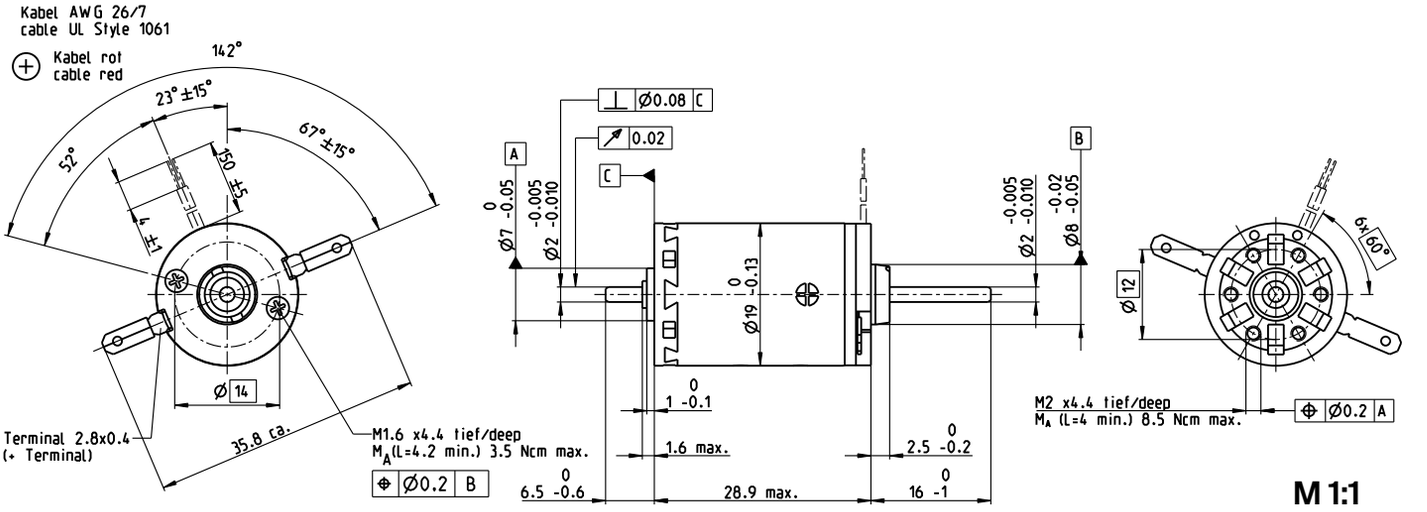
Screw Drive
∅22 mm
Page 414/415



Recommended Electronics:

Notes	Page **34**
ESCON Module 24/2	486
ESCON 36/2 DC	486

A-max 19 ∅19 mm, Precious Metal Brushes CLL, 1.5 Watt



Stock program
Standard program
Special program (on request)

Part Numbers

with terminals	110090	110091	110092	110093	110094	**110095**	110096	110097	110098	
with cables	139832	352925	352926	352927	352928	352929	352930	315468	352931	

Motor Data										
Values at nominal voltage										
1 Nominal voltage	V	1.2	2.4	3	4.8	6	7.2	9	12	18
2 No load speed	rpm	6390	7160	6230	6190	6090	6130	6130	6140	6590
3 No load current	mA	88.3	52	34.2	21.2	16.6	14	11.2	8.41	6.19
4 Nominal speed	rpm	5210	4410	2500	2410	2330	2290	2280	2210	2630
5 Nominal torque (max. continuous torque)	mNm	1.33	2.49	3.62	3.57	3.59	3.51	3.51	3.43	3.38
6 Nominal current (max. continuous current)	A	0.84	0.84	0.833	0.511	0.405	0.332	0.265	0.195	0.138
7 Stall torque	mNm	6.23	6.28	6	5.89	5.89	5.68	5.67	5.44	5.73
8 Stall current	A	3.55	2.01	1.34	0.816	0.642	0.52	0.415	0.3	0.226
9 Max. efficiency	%	72	71	71	71	71	70	70	70	70
Characteristics										
10 Terminal resistance	Ω	0.338	1.19	2.24	5.88	9.34	13.8	21.7	40	79.7
11 Terminal inductance	mH	0.019	0.059	0.121	0.314	0.506	0.719	1.12	1.98	3.87
12 Torque constant	mNm/A	1.76	3.12	4.49	7.22	9.17	10.9	13.7	18.1	25.4
13 Speed constant	rpm/V	5440	3060	2130	1320	1040	874	699	526	377
14 Speed / torque gradient	rpm/mNm	1050	1170	1060	1080	1060	1110	1110	1160	1180
15 Mechanical time constant	ms	27.9	25.4	24.3	24.2	24.1	24.3	24.3	25	24.7
16 Rotor inertia	gcm²	2.54	2.08	2.18	2.15	2.17	2.09	2.09	2.06	1.99

Specifications

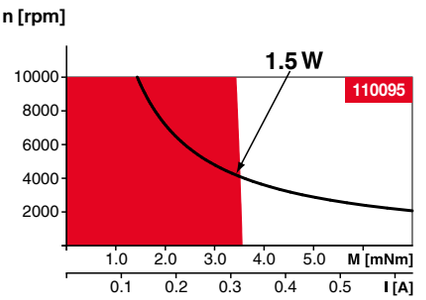
Thermal data		
17	Thermal resistance housing-ambient	21.3 K/W
18	Thermal resistance winding-housing	10.5 K/W
19	Thermal time constant winding	11 s
20	Thermal time constant motor	201 s
21	Ambient temperature	-30...+65°C
22	Max. winding temperature	+85°C
Mechanical data (sleeve bearings)		
23	Max. speed	10 000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	1 N
27	Max. force for press fits (static)	80 N
	(static, shaft supported)	440 N
28	Max. radial load, 5 mm from flange	2.7 N
Mechanical data (ball bearings)		
23	Max. speed	10 000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	3.3 N
27	Max. force for press fits (static)	45 N
	(static, shaft supported)	440 N
28	Max. radial load, 5 mm from flange	11.9 N
Other specifications		
29	Number of pole pairs	1
30	Number of commutator segments	9
31	Weight of motor	34 g

CLL = Capacitor Long Life

Values listed in the table are nominal.
Explanation of the figures on page 72.

Option
Ball bearings in place of sleeve bearings
Without CLL

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

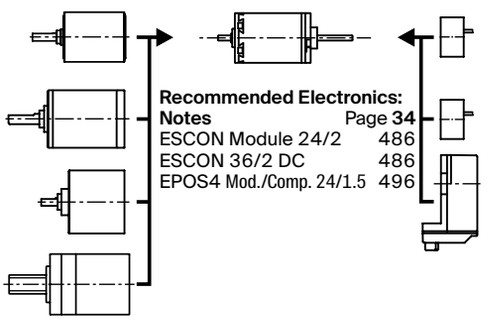
Details on catalog page 34

Planetary Gearhead
∅19 mm
0.1 - 0.3 Nm
Page 371

Planetary Gearhead
∅22 mm
0.5 - 2.0 Nm
Page 374/376

Spur Gearhead
∅24 mm
0.1 Nm
Page 380

Screw Drive
∅22 mm
Page 414/415



Recommended Electronics:

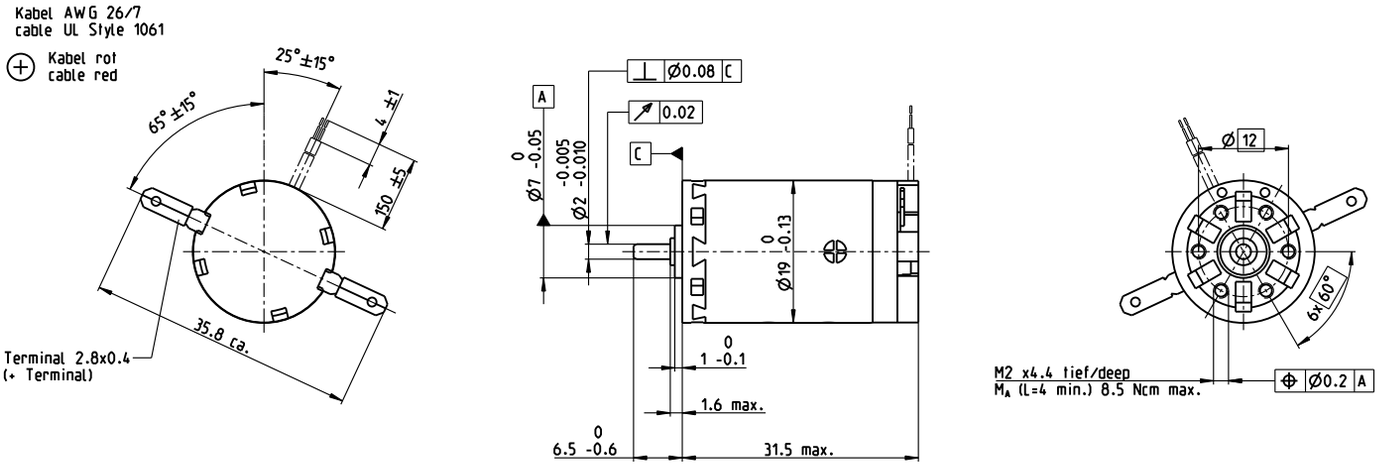
Notes	Page **34**
ESCON Module 24/2	486
ESCON 36/2 DC	486
EPOS4 Mod./Comp. 24/1.5	496

Encoder MR
32 CPT,
2 / 3 channels
Page 460

Encoder MR
128 / 256 / 512 CPT,
2 / 3 channels
Page 461

Encoder Enc
22 mm
100 CPT, 2 channels
Page 468

A-max 19 ∅19 mm, Graphite Brushes, 2.5 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

with terminals	249982	249983	249984	249985	249986	**249987**	249988	249989	249990	
with cables	240133	352942	310977	352943	352944	352945	352946	352947	310980	

Motor Data										
Values at nominal voltage										
1 Nominal voltage	V	2.4	3.6	6	7.2	9	12	15	18	24
2 No load speed	rpm	12400	10400	12200	8980	8850	9930	9930	8910	8470
3 No load current	mA	292	158	114	66.1	51.9	44.6	35.7	26.3	18.6
4 Nominal speed	rpm	11700	8350	9310	4750	4630	5670	5670	4520	4020
5 Nominal torque (max. continuous torque)	mNm	0.759	1.78	2.75	3.98	4.02	3.89	3.89	3.83	3.8
6 Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.612	0.485	0.397	0.317	0.235	0.167
7 Stall torque	mNm	14.1	9.66	12.1	8.84	8.83	9.47	9.44	8.16	7.63
8 Stall current	A	8.04	3.09	2.71	1.23	0.963	0.867	0.691	0.45	0.301
9 Max. efficiency	%	64	59	63	59	59	60	60	58	57
Characteristics										
10 Terminal resistance	Ω	0.299	1.16	2.22	5.88	9.35	13.8	21.7	40	79.8
11 Terminal inductance	mH	0.019	0.059	0.121	0.314	0.506	0.719	1.12	1.98	3.87
12 Torque constant	mNm/A	1.76	3.12	4.49	7.22	9.17	10.9	13.7	18.1	25.4
13 Speed constant	rpm/V	5440	3060	2130	1320	1040	874	699	526	377
14 Speed / torque gradient	rpm/mNm	925	1140	1050	1080	1060	1110	1110	1160	1180
15 Mechanical time constant	ms	24.9	25.1	24.4	24.5	24.4	24.6	24.7	25.4	25
16 Rotor inertia	gcm²	2.57	2.1	2.21	2.17	2.2	2.12	2.12	2.09	2.02

Specifications

Thermal data

17	Thermal resistance housing-ambient	21.3 K/W
18	Thermal resistance winding-housing	10.5 K/W
19	Thermal time constant winding	11.0 s
20	Thermal time constant motor	201 s
21	Ambient temperature	-30...+85°C
22	Max. winding temperature	+125°C

Mechanical data (sleeve bearings)

23	Max. speed	12000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	1 N
27	Max. force for press fits (static)	80 N
28	Max. radial load, 5 mm from flange	2.7 N

Mechanical data (ball bearings)

23	Max. speed	12000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	3.3 N
27	Max. force for press fits (static)	45 N
28	Max. radial load, 5 mm from flange	11.9 N

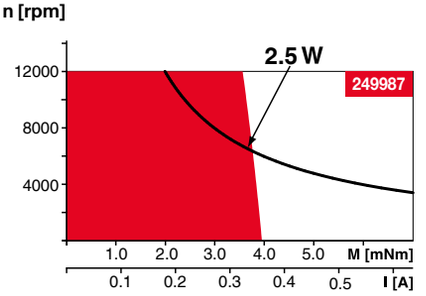
Other specifications

29	Number of pole pairs	1
30	Number of commutator segments	9
31	Weight of motor	33 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Option
Ball bearings in place of sleeve bearings

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

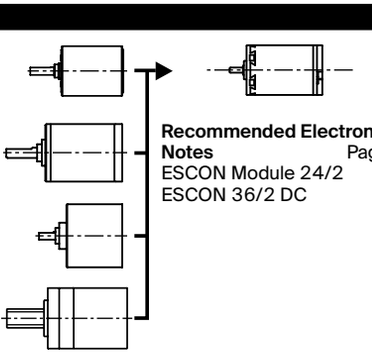
Details on catalog page 34

Planetary Gearhead
∅19 mm
0.1 - 0.3 Nm
Page 371

Planetary Gearhead
∅22 mm
0.5 - 2.0 Nm
Page 374/376

Spur Gearhead
∅24 mm
0.1 Nm
Page 380

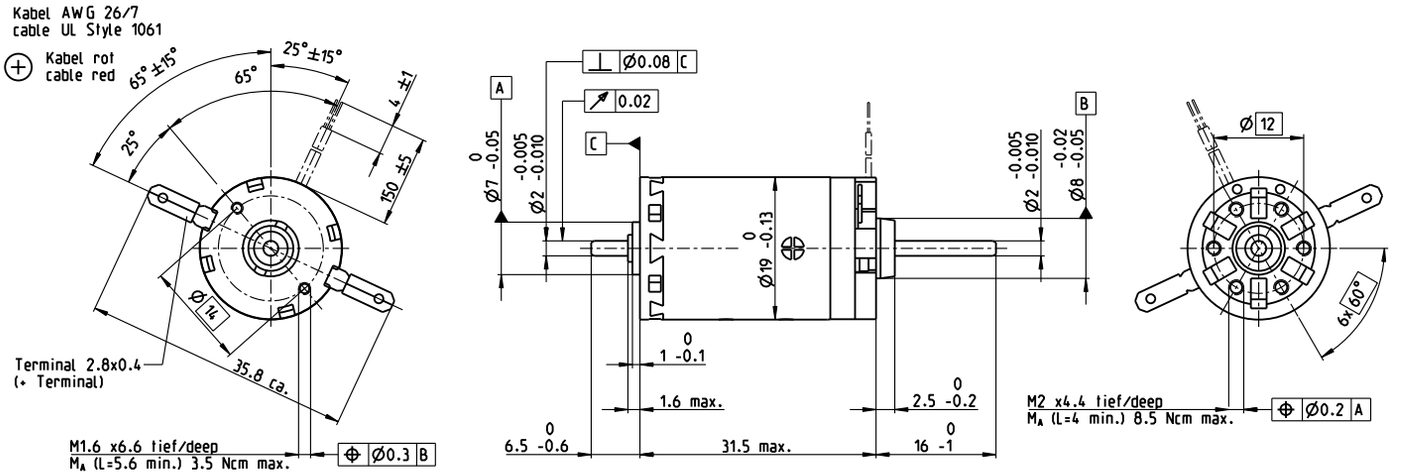
Screw Drive
∅22 mm
Page 414/415



Recommended Electronics:

Notes	Page **34**
ESCON Module 24/2	486
ESCON 36/2 DC	486

A-max 19 ∅19 mm, Graphite Brushes, 2.5 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

with terminals	249991	249992	249993	249994	249995	249996	249997	249998	249999
with cables	240035	352971	353590	352972	352973	344596	352974	352975	352976

Motor Data										
	Values at nominal voltage									
1	Nominal voltage	V	2.4	3.6	6	7.2	9	12	15	18	24
2	No load speed	rpm	12400	10400	12200	8980	8850	9930	9930	8910	8470
3	No load current	mA	292	158	114	66.1	51.9	44.6	35.7	26.3	18.6
4	Nominal speed	rpm	11700	8350	9310	4750	4630	5670	5670	4520	4020
5	Nominal torque (max. continuous torque)	mNm	0.759	1.78	2.75	3.98	4.02	3.89	3.89	3.83	3.8
6	Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.612	0.485	0.397	0.317	0.235	0.167
7	Stall torque	mNm	14.1	9.66	12.1	8.84	8.83	9.47	9.44	8.16	7.63
8	Stall current	A	8.04	3.09	2.71	1.23	0.963	0.867	0.691	0.45	0.301
9	Max. efficiency	%	64	59	63	59	59	60	60	58	57
	Characteristics									
10	Terminal resistance	Ω	0.299	1.16	2.22	5.88	9.35	13.8	21.7	40	79.8
11	Terminal inductance	mH	0.019	0.059	0.121	0.314	0.506	0.719	1.12	1.98	3.87
12	Torque constant	mNm/A	1.76	3.12	4.49	7.22	9.17	10.9	13.7	18.1	25.4
13	Speed constant	rpm/V	5440	3060	2130	1320	1040	874	699	526	377
14	Speed / torque gradient	rpm/mNm	925	1140	1050	1080	1060	1110	1110	1160	1180
15	Mechanical time constant	ms	24.6	24.8	24	24.2	24.1	24.2	24.3	25	24.6
16	Rotor inertia	gcm²	2.54	2.07	2.18	2.14	2.16	2.09	2.09	2.06	1.99

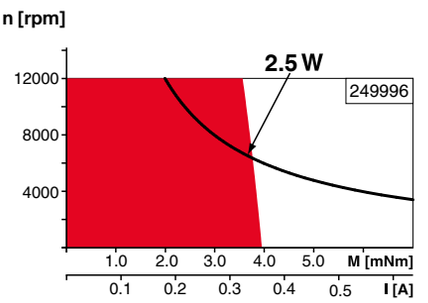
Specifications

	Thermal data	
17	Thermal resistance housing-ambient	21.3 K/W
18	Thermal resistance winding-housing	10.5 K/W
19	Thermal time constant winding	11.0 s
20	Thermal time constant motor	201 s
21	Ambient temperature	-30...+85°C
22	Max. winding temperature	+125°C
	Mechanical data (sleeve bearings)	
23	Max. speed	12000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	1 N
27	Max. force for press fits (static)	80 N
	(static, shaft supported)	480 N
28	Max. radial load, 5 mm from flange	2.7 N
	Mechanical data (ball bearings)	
23	Max. speed	12000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	3.3 N
27	Max. force for press fits (static)	45 N
	(static, shaft supported)	240 N
28	Max. radial load, 5 mm from flange	11.9 N
	Other specifications	
29	Number of pole pairs	1
30	Number of commutator segments	9
31	Weight of motor	34 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Option
Ball bearings in place of sleeve bearings

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

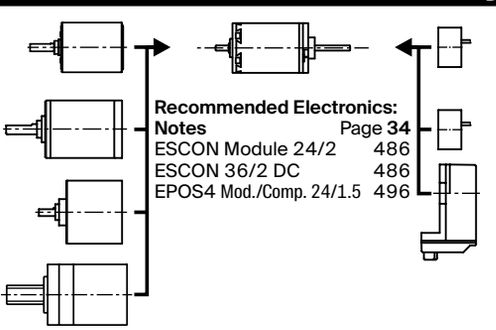
Details on catalog page 34

Planetary Gearhead
∅19 mm
0.1 - 0.3 Nm
Page 371

Planetary Gearhead
∅22 mm
0.5 - 2.0 Nm
Page 374/376

Spur Gearhead
∅24 mm
0.1 Nm
Page 380

Screw Drive
∅22 mm
Page 414/415



Recommended Electronics:

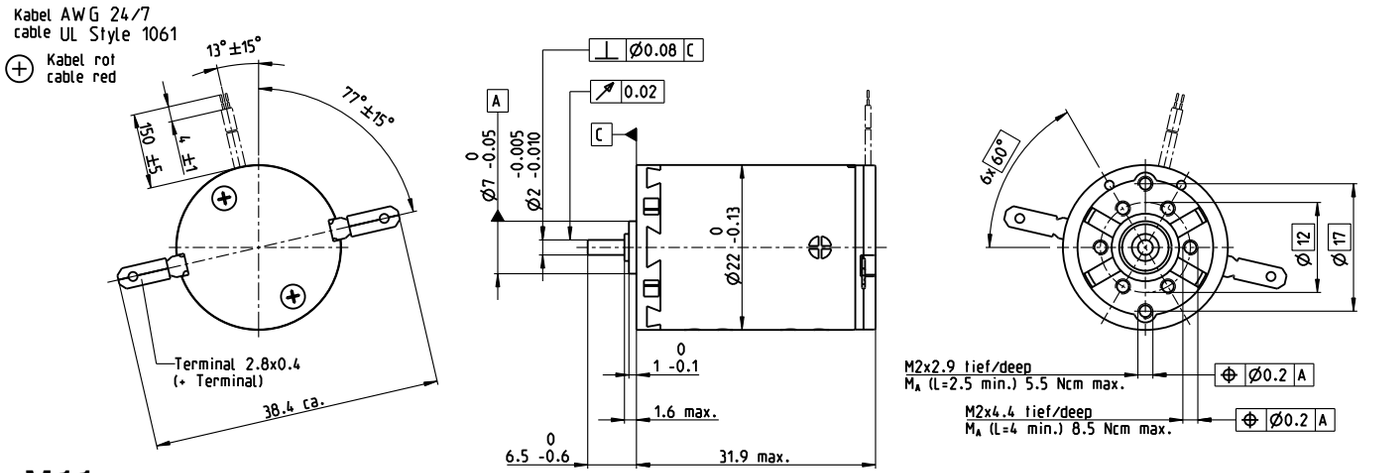
Notes	Page **34**
ESCON Module 24/2	486
ESCON 36/2 DC	486
EPOS4 Mod./Comp. 24/1.5	496

Encoder MR
32 CPT,
2 / 3 channels
Page 460

Encoder MR
128 / 256 / 512 CPT,
2 / 3 channels
Page 461

Encoder Enc
22 mm
100 CPT, 2 channels
Page 468

A-max 22 ∅22 mm, Precious Metal Brushes CLL, 5 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

with terminals	110117	110119	110120	**110121**	110122	110123	110124	**110125**	110126	110127	**110128**	110129	
with cables	139838	218799	238798	202413	258367	137255	134267	134666	267423	137476	310003	342390	

Motor Data														
	Values at nominal voltage													
1	Nominal voltage	V	6	9	9	12	12	15	18	24	30	36	48	48
2	No load speed	rpm	9630	9970	8760	10400	9400	10300	9970	10700	10800	9800	9280	8370
3	No load current	mA	29.5	20.8	16.8	16.8	14.2	13.1	10.4	8.81	7.18	5.06	3.47	2.93
4	Nominal speed	rpm	7390	7300	6100	7770	6700	7530	7220	7970	8070	7000	6420	5520
5	Nominal torque (max. continuous torque)	mNm	4.81	6.22	6.3	6.24	6.18	6.1	6.05	6.02	5.98	5.94	5.83	5.9
6	Nominal current (max. continuous current)	A	0.84	0.745	0.661	0.586	0.523	0.451	0.362	0.291	0.234	0.175	0.122	0.111
7	Stall torque	mNm	20.1	22.9	20.5	24.3	21.4	22.9	22	23.5	23.5	20.8	19	17.4
8	Stall current	A	3.42	2.68	2.11	2.23	1.77	1.65	1.28	1.11	0.894	0.599	0.387	0.32
9	Max. efficiency	%	83	84	83	84	83	83	83	83	83	83	82	82
	Characteristics													
10	Terminal resistance	Ω	1.76	3.36	4.27	5.39	6.78	9.07	14	21.6	33.5	60.1	124	150
11	Terminal inductance	mH	0.106	0.222	0.288	0.362	0.445	0.584	0.89	1.37	2.1	3.68	7.29	8.95
12	Torque constant	mNm/A	5.9	8.55	9.73	10.9	12.1	13.9	17.1	21.2	26.2	34.8	48.9	54.3
13	Speed constant	rpm/V	1620	1120	981	875	790	689	558	450	364	274	195	176
14	Speed / torque gradient	rpm/mNm	482	438	430	432	443	451	458	459	465	474	494	486
15	Mechanical time constant	ms	20.5	19.8	19.7	19.7	19.8	20.2	20.1	20.2	20.3	20.3	20.5	20.4
16	Rotor inertia	gcm²	4.07	4.32	4.37	4.36	4.26	4.27	4.2	4.2	4.16	4.09	3.97	4.01

Specifications

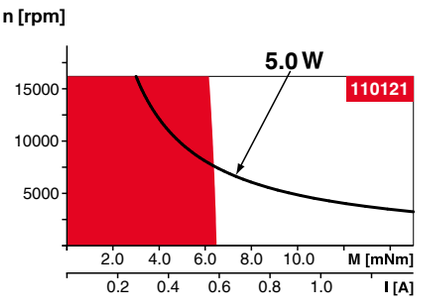
	Thermal data	
17	Thermal resistance housing-ambient	20 K/W
18	Thermal resistance winding-housing	6.0 K/W
19	Thermal time constant winding	10.2 s
20	Thermal time constant motor	313 s
21	Ambient temperatureC	-30...+65°C
22	Max. winding temperature	+85°C
	Mechanical data (sleeve bearings)	
23	Max. speed	16 000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	1 N
27	Max. force for press fits (static)	80 N
28	Max. radial load, 5 mm from flange	2.8 N
	Mechanical data (ball bearings)	
23	Max. speed	16 000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	3.3 N
27	Max. force for press fits (static)	45 N
28	Max. radial load, 5 mm from flange	12.3 N
	Other specifications	
29	Number of pole pairs	1
30	Number of commutator segments	9
31	Weight of motor	54 g

CLL = Capacitor Long Life

Values listed in the table are nominal.
Explanation of the figures on page 72.

Option
Ball bearings in place of sleeve bearings
Without CLL

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

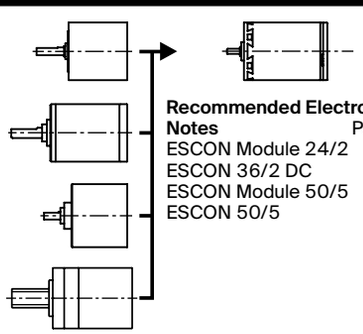
Details on catalog page 34

Planetary Gearhead
∅22 mm
0.1 - 0.6 Nm
Page 372/373

Planetary Gearhead
∅22 mm
0.5 - 2.0 Nm
Page 374/376

Spur Gearhead
∅24 mm
0.1 Nm
Page 380

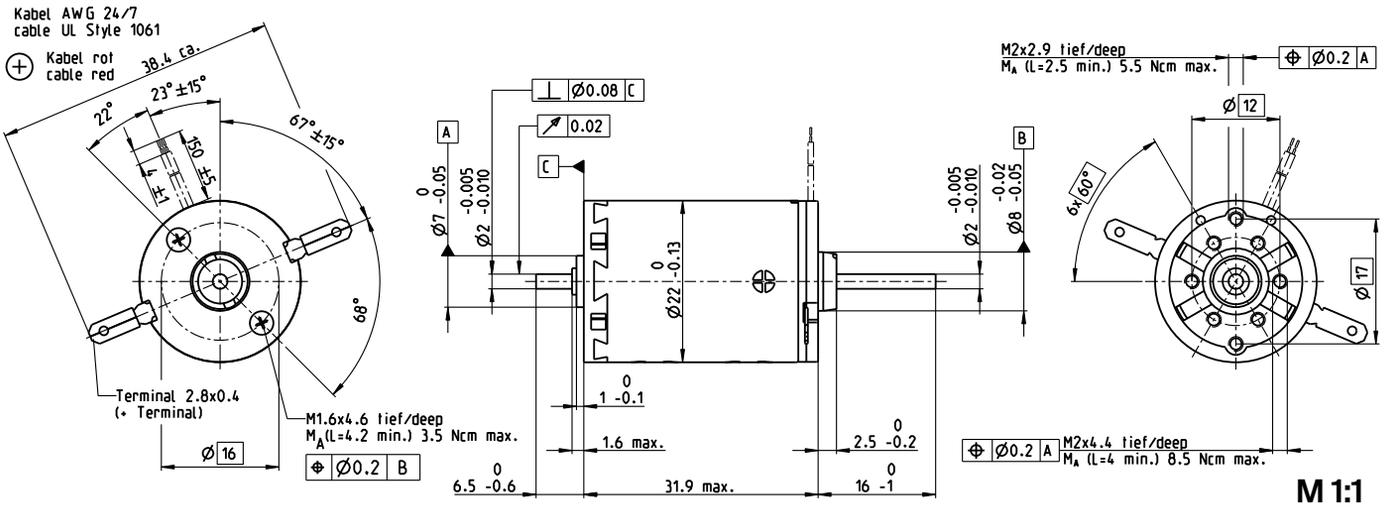
Screw Drive
∅22 mm
Page 414/415



Recommended Electronics:

Notes	Page **34**
ESCON Module 24/2	486
ESCON 36/2 DC	486
ESCON Module 50/5	487
ESCON 50/5	489

A-max 22 ∅22 mm, Precious Metal Brushes CLL, 3.5 Watt



Stock program
Standard program
Special program (on request)

Part Numbers

with terminals	110130	110132	110133	110134	110135	110136	110137	110138	110139	110140	110141	110142
with cables	139846	352986	352987	352988	352989	352990	352991	352992	352993	352994	352995	352996

Motor Data														
	Values at nominal voltage													
1	Nominal voltage	V	4.5	6	7.2	7.2	7.2	9	12	15	18	24	36	42
2	No load speed	rpm	7210	6630	7000	6240	5620	6140	6630	6680	6480	6520	6950	7320
3	No load current	mA	26.7	17.8	16	13.6	11.8	10.6	8.88	7.17	5.73	4.33	3.16	2.92
4	Nominal speed	rpm	5010	3940	4330	3550	2890	3400	3890	3930	3710	3720	4100	4490
5	Nominal torque (max. continuous torque)	mNm	4.82	6.27	6.31	6.31	6.24	6.21	6.16	6.15	6.11	6.05	5.91	5.95
6	Nominal current (max. continuous current)	A	0.84	0.749	0.662	0.589	0.525	0.457	0.368	0.296	0.237	0.177	0.123	0.112
7	Stall torque	mNm	15.4	15.3	16.4	14.6	12.8	14	14.9	15	14.4	14.2	14.5	15.5
8	Stall current	A	2.61	1.79	1.69	1.34	1.06	1.01	0.872	0.706	0.547	0.407	0.296	0.286
9	Max. efficiency	%	81	81	82	81	80	81	81	81	81	81	81	81
	Characteristics													
10	Terminal resistance	Ω	1.72	3.36	4.27	5.39	6.78	8.9	13.8	21.2	32.9	59	122	147
11	Terminal inductance	mH	0.106	0.222	0.288	0.362	0.445	0.585	0.89	1.37	2.1	3.69	7.29	8.95
12	Torque constant	mNm/A	5.9	8.55	9.73	10.9	12.1	13.9	17.1	21.2	26.2	34.8	48.9	54.3
13	Speed constant	rpm/V	1620	1120	981	875	790	689	558	450	364	274	195	176
14	Speed / torque gradient	rpm/mNm	474	438	430	432	443	443	449	450	456	465	485	477
15	Mechanical time constant	ms	20.2	19.8	19.7	19.7	19.8	19.8	19.8	19.8	19.9	19.9	20.2	20
16	Rotor inertia	gcm²	4.07	4.32	4.38	4.36	4.26	4.27	4.2	4.21	4.16	4.1	3.97	4.01

Specifications

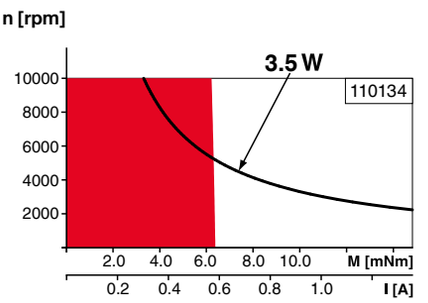
	Thermal data	
17	Thermal resistance housing-ambient	20 K/W
18	Thermal resistance winding-housing	6.0 K/W
19	Thermal time constant winding	10.2 s
20	Thermal time constant motor	313 s
21	Ambient temperature	-30...+65°C
22	Max. winding temperature	+85°C
	Mechanical data (sleeve bearings)	
23	Max. speed	10 000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	1 N
27	Max. force for press fits (static)	80 N
	(static, shaft supported)	440 N
28	Max. radial load, 5 mm from flange	2.8 N
	Mechanical data (ball bearings)	
23	Max. speed	10 000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	3.3 N
27	Max. force for press fits (static)	45 N
	(static, shaft supported)	440 N
28	Max. radial load, 5 mm from flange	12.3 N
	Other specifications	
29	Number of pole pairs	1
30	Number of commutator segments	9
31	Weight of motor	54 g

CLL = Capacitor Long Life

Values listed in the table are nominal.
Explanation of the figures on page 72.

Option
Ball bearings in place of sleeve bearings
Without CLL

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

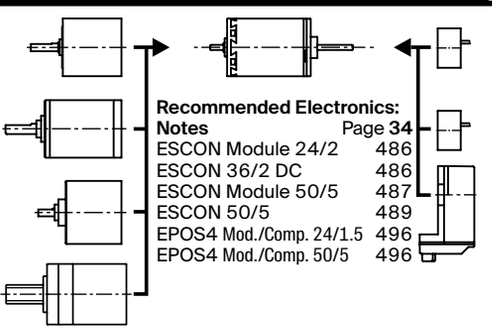
Details on catalog page 34

Planetary Gearhead
∅22 mm
0.1 - 0.6 Nm
Page 372/373

Planetary Gearhead
∅22 mm
0.5 - 2.0 Nm
Page 374/376

Spur Gearhead
∅24 mm
0.1 Nm
Page 380

Screw Drive
∅22 mm
Page 414/415



Recommended Electronics:

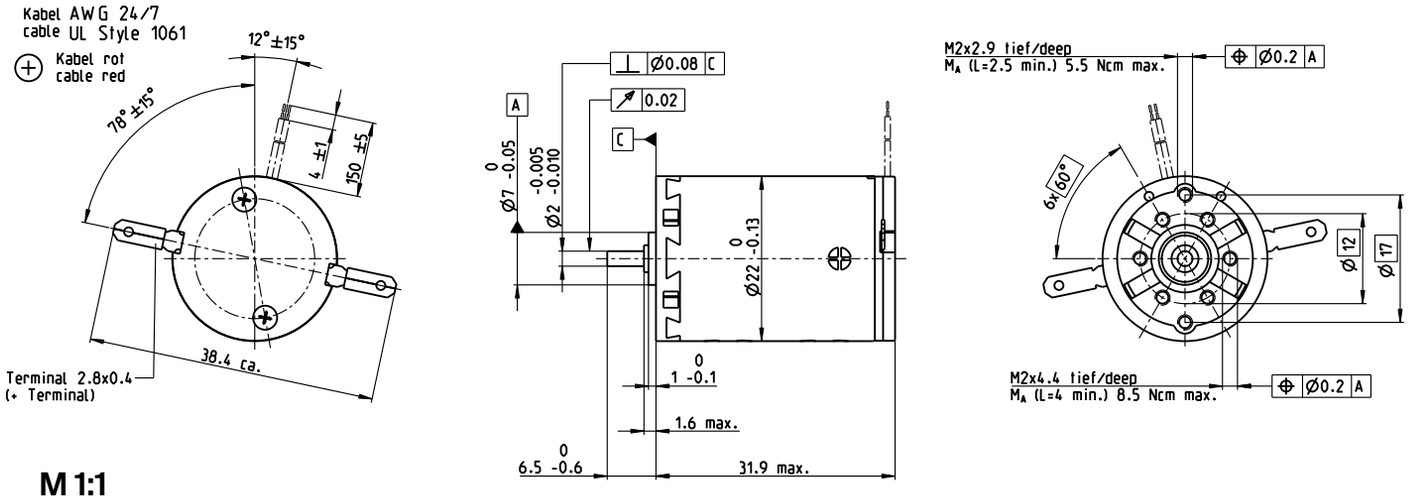
Notes	Page **34**
ESCON Module 24/2	486
ESCON 36/2 DC	486
ESCON Module 50/5	487
ESCON 50/5	489
EPOS4 Mod./Comp. 24/1.5	496
EPOS4 Mod./Comp. 50/5	496

Encoder MR
32 CPT,
2 / 3 channels
Page 460

Encoder MR
128 / 256 / 512 CPT,
2 / 3 channels
Page 461

Encoder Enc
22 mm
100 CPT, 2 channels
Page 468

A-max 22 ∅22 mm, Graphite Brushes, 6 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

with terminals	110143	110145	110146	**110147**	110148	110149	110150	**110151**	110152	110153	110154	110155
with cables	139840	353017	199807	320206	323856	108828	199424	202921	267433	325492	313302	353019

Motor Data

	Values at nominal voltage													
1	Nominal voltage	V	6	9	9	12	12	15	18	24	24	36	48	48
2	No load speed	rpm	9240	9690	8500	10200	9170	10000	9770	10500	8480	9630	9110	8210
3	No load current	mA	83.1	57.9	49.6	45.8	40.5	36	29	23.7	18.4	14.2	9.99	8.84
4	Nominal speed	rpm	6240	6530	5350	7060	6000	6890	6600	7380	5270	6420	5840	4940
5	Nominal torque (max. continuous torque)	mNm	5.91	6.88	7.04	6.96	6.95	6.93	6.92	6.9	6.97	6.86	6.75	6.86
6	Nominal current (max. continuous current)	A	1.08	0.859	0.77	0.681	0.613	0.534	0.432	0.347	0.283	0.21	0.147	0.135
7	Stall torque	mNm	19.4	22.1	19.8	23.7	20.9	22.9	22	23.7	18.9	21.1	19.2	17.6
8	Stall current	A	3.29	2.59	2.04	2.17	1.72	1.65	1.29	1.12	0.721	0.606	0.393	0.325
9	Max. efficiency	%	67	70	69	72	70	72	72	73	70	72	71	70
	Characteristics													
10	Terminal resistance	Ω	1.82	3.48	4.42	5.53	6.96	9.09	14	21.5	33.3	59.4	122	148
11	Terminal inductance	mH	0.106	0.223	0.288	0.363	0.445	0.585	0.891	1.37	2.1	3.69	7.3	8.97
12	Torque constant	mNm/A	5.9	8.55	9.73	10.9	12.1	13.9	17.1	21.2	26.2	34.8	48.9	54.3
13	Speed constant	rpm/V	1620	1120	981	875	790	689	558	450	364	274	195	176
14	Speed / torque gradient	rpm/mNm	500	454	446	444	455	452	457	456	461	468	487	479
15	Mechanical time constant	ms	20.9	20.2	20.1	19.9	19.9	19.9	19.7	19.7	19.8	19.7	19.9	19.8
16	Rotor inertia	gcm²	4	4.25	4.3	4.29	4.19	4.2	4.13	4.13	4.09	4.02	3.9	3.94

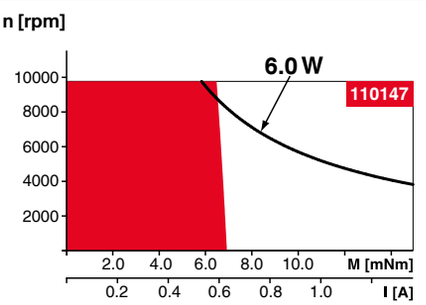
Specifications

	Thermal data	
17	Thermal resistance housing-ambient	20 K/W
18	Thermal resistance winding-housing	6.0 K/W
19	Thermal time constant winding	10.2 s
20	Thermal time constant motor	314 s
21	Ambient temperature	-30...+85°C
22	Max. winding temperature	+125°C
	Mechanical data (sleeve bearings)	
23	Max. speed	9800 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	1 N
27	Max. force for press fits (static)	80 N
28	Max. radial load, 5 mm from flange	2.8 N
	Mechanical data (ball bearings)	
23	Max. speed	9800 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	3.3 N
27	Max. force for press fits (static)	45 N
28	Max. radial load, 5 mm from flange	12.3 N
	Other specifications	
29	Number of pole pairs	1
30	Number of commutator segments	9
31	Weight of motor	54 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Option
Ball bearings in place of sleeve bearings

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

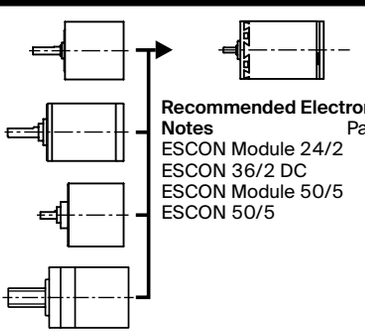
Details on catalog page 34

Planetary Gearhead
∅22 mm
0.1 - 0.6 Nm
Page 372/373

Planetary Gearhead
∅22 mm
0.5 - 2.0 Nm
Page 374/376

Spur Gearhead
∅24 mm
0.1 Nm
Page 380

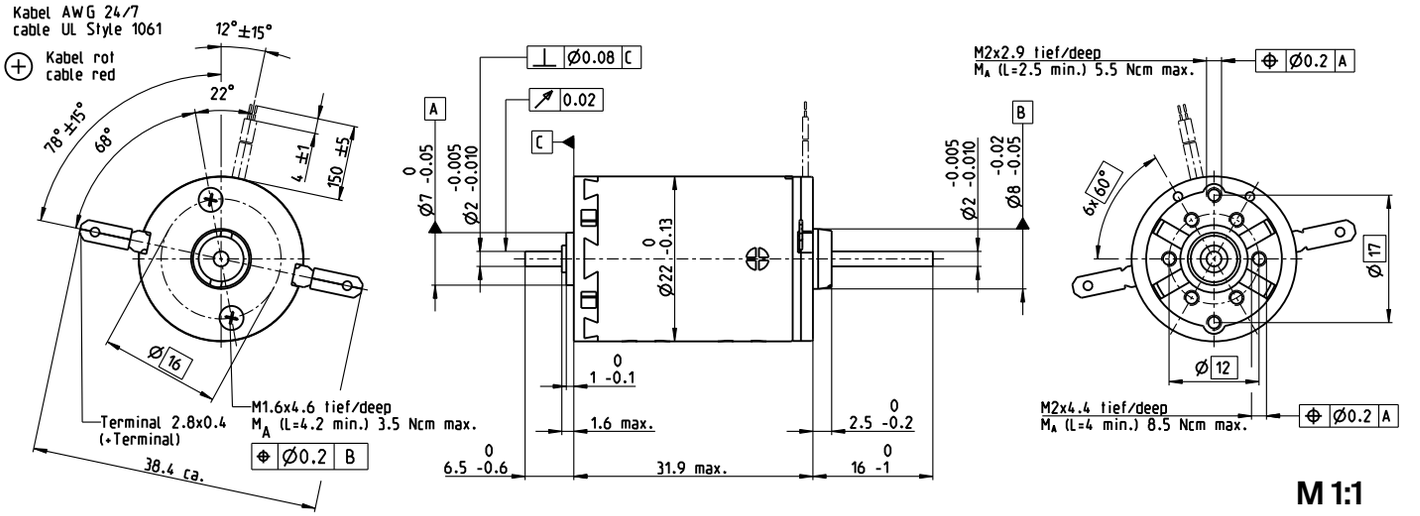
Screw Drive
∅22 mm
Page 414/415



Recommended Electronics:

Notes	Page **34**
ESCON Module 24/2	486
ESCON 36/2 DC	486
ESCON Module 50/5	487
ESCON 50/5	489

A-max 22 ∅22 mm, Graphite Brushes, 6 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

with terminals	110156	110158	110159	110160	110161	110162	110163	**110164**	110165	110166	110167	110168
with cables	139848	353023	353024	231171	353025	353026	231174	353027	353028	353029	316659	353603

Motor Data													
	Values at nominal voltage												
1	Nominal voltage	V	6	9	9	12	12	15	18	24	24	36	48	48
2	No load speed	rpm	9240	9690	8500	10200	9170	10000	9770	10500	8480	9630	9110	8210
3	No load current	mA	83.1	57.9	49.6	45.8	40.5	36	29	23.7	18.4	14.2	9.99	8.84
4	Nominal speed	rpm	6240	6530	5350	7060	6000	6890	6600	7380	5270	6420	5840	4940
5	Nominal torque (max. continuous torque)	mNm	5.91	6.88	7.04	6.96	6.95	6.93	6.92	6.9	6.97	6.86	6.75	6.86
6	Nominal current (max. continuous current)	A	1.08	0.859	0.77	0.681	0.613	0.534	0.432	0.347	0.283	0.21	0.147	0.135
7	Stall torque	mNm	19.4	22.1	19.8	23.7	20.9	22.9	22	23.7	18.9	21.1	19.2	17.6
8	Stall current	A	3.29	2.59	2.04	2.17	1.72	1.65	1.29	1.12	0.721	0.606	0.393	0.325
9	Max. efficiency	%	67	70	69	72	70	72	72	73	70	72	71	70
	Characteristics												
10	Terminal resistance	Ω	1.82	3.48	4.42	5.53	6.96	9.09	14	21.5	33.3	59.4	122	148
11	Terminal inductance	mH	0.106	0.223	0.288	0.363	0.445	0.585	0.891	1.37	2.1	3.69	7.3	8.97
12	Torque constant	mNm/A	5.9	8.55	9.73	10.9	12.1	13.9	17.1	21.2	26.2	34.8	48.9	54.3
13	Speed constant	rpm/V	1620	1120	981	875	790	689	558	450	364	274	195	176
14	Speed / torque gradient	rpm/mNm	500	454	446	444	455	452	457	456	461	468	487	479
15	Mechanical time constant	ms	21.3	20.5	20.4	20.2	20.3	20.2	20.1	20.1	20.1	20.1	20.2	20.1
16	Rotor inertia	gcm²	4.07	4.32	4.37	4.36	4.26	4.27	4.2	4.2	4.16	4.09	3.97	4.01

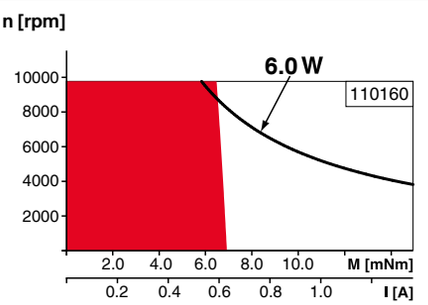
Specifications

	Thermal data	
17	Thermal resistance housing-ambient	20 K/W
18	Thermal resistance winding-housing	6.0 K/W
19	Thermal time constant winding	10.2 s
20	Thermal time constant motor	313 s
21	Ambient temperature	-30...+85°C
22	Max. winding temperature	+125°C
	Mechanical data (sleeve bearings)	
23	Max. speed	9800 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	1 N
27	Max. force for press fits (static)	80 N
	(static, shaft supported)	440 N
28	Max. radial load, 5 mm from flange	2.8 N
	Mechanical data (ball bearings)	
23	Max. speed	9800 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	3.3 N
27	Max. force for press fits (static)	45 N
	(static, shaft supported)	240 N
28	Max. radial load, 5 mm from flange	12.3 N
	Other specifications	
29	Number of pole pairs	1
30	Number of commutator segments	9
31	Weight of motor	54 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Option
Ball bearings in place of sleeve bearings

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

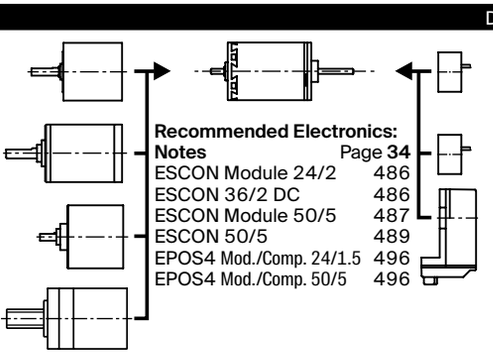
Details on catalog page 34

Planetary Gearhead
∅22 mm
0.1 - 0.6 Nm
Page 372/373

Planetary Gearhead
∅22 mm
0.5 - 2.0 Nm
Page 374/376

Spur Gearhead
∅24 mm
0.1 Nm
Page 380

Screw Drive
∅22 mm
Page 414/415



Recommended Electronics:

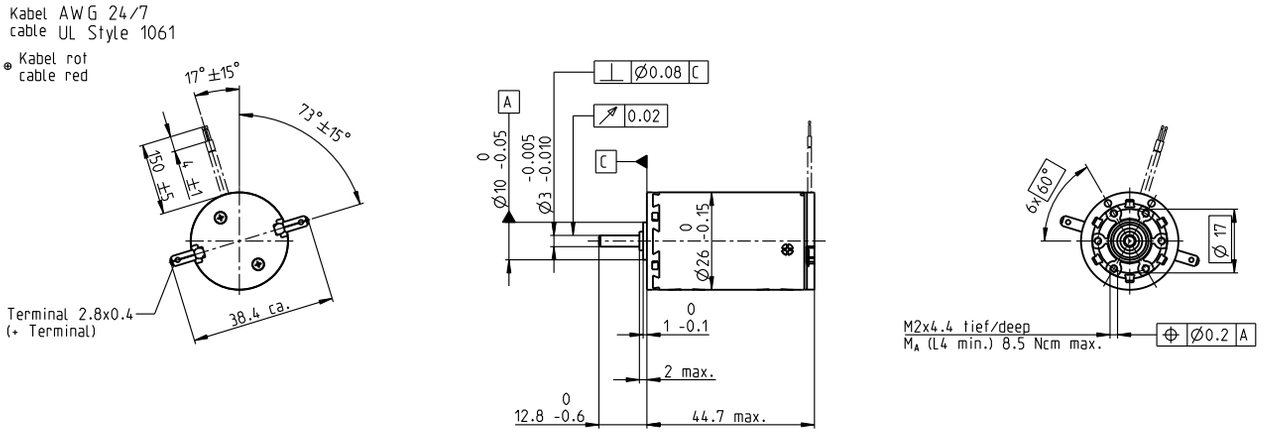
Notes	Page **34**
ESCON Module 24/2	486
ESCON 36/2 DC	486
ESCON Module 50/5	487
ESCON 50/5	489
EPOS4 Mod./Comp. 24/1.5	496
EPOS4 Mod./Comp. 50/5	496

Encoder MR
32 CPT,
2 / 3 channels
Page 460

Encoder MR
128 / 256 / 512 CPT,
2 / 3 channels
Page 461

Encoder Enc
22 mm
100 CPT, 2 channels
Page 468

A-max 26 ∅26 mm, Precious Metal Brushes CLL, 7 Watt



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

with terminals	110181	110182	110183	110184	110185	110186	110187	110188	110189	110190	110191
with cables	353078	353079	353080	353081	329757	353082	332818	353083	353084	353085	353086

Motor Data													
	Values at nominal voltage												
1	Nominal voltage	V	4.5	6	9	12	15	18	24	30	36	42	48
2	No load speed	rpm	7320	8670	6160	6780	6720	6690	5670	6090	6780	6570	6050
3	No load current	mA	78.9	77.7	30.2	26.3	20.7	17.1	9.97	8.9	8.76	7.15	5.5
4	Nominal speed	rpm	6900	8130	5000	5340	5060	5010	3940	4370	5060	4820	4280
5	Nominal torque (max. continuous torque)	mNm	4.46	5.02	11.3	13.7	15.8	15.6	15.3	15.3	15.2	15	15
6	Nominal current (max. continuous current)	A	0.84	0.84	0.84	0.84	0.766	0.627	0.391	0.336	0.31	0.254	0.204
7	Stall torque	mNm	67.3	73.5	58.8	63.5	63.6	62.1	50.3	54.2	60.2	56.4	51.4
8	Stall current	A	11.5	11.2	4.25	3.78	3.01	2.43	1.25	1.16	1.2	0.93	0.683
9	Max. efficiency	%	84	84	84	84	84	84	83	84	84	84	83
	Characteristics												
10	Terminal resistance	Ω	0.39	0.536	2.12	3.17	4.99	7.41	19.2	25.8	30.1	45.1	70.2
11	Terminal inductance	mH	0.04	0.051	0.227	0.333	0.529	0.77	1.9	2.58	2.99	4.34	6.68
12	Torque constant	mNm/A	5.84	6.57	13.9	16.8	21.2	25.5	40.1	46.7	50.3	60.6	75.2
13	Speed constant	rpm/V	1640	1450	689	569	451	374	238	205	190	158	127
14	Speed / torque gradient	rpm/mNm	109	119	105	108	106	108	114	113	114	117	119
15	Mechanical time constant	ms	16.5	16	15	14.9	14.8	14.8	14.9	14.9	14.9	15	15
16	Rotor inertia	gcm²	14.4	12.9	13.6	13.2	13.3	13.1	12.5	12.6	12.5	12.2	12.1

Specifications

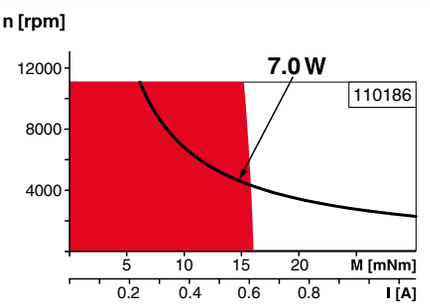
	Thermal data	
17	Thermal resistance housing-ambient	13.2 K/W
18	Thermal resistance winding-housing	3.2 K/W
19	Thermal time constant winding	13.8 s
20	Thermal time constant motor	473 s
21	Ambient temperature	-30...+65°C
22	Max. winding temperature	+85°C
	Mechanical data (sleeve bearings)	
23	Max. speed	11000 rpm
24	Axial play	0.1 - 0.2 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	1.7 N
27	Max. force for press fits (static)	80 N
28	Max. radial load, 5 mm from flange	5.5 N
	Mechanical data (ball bearings)	
23	Max. speed	11000 rpm
24	Axial play	0.1 - 0.2 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	5 N
27	Max. force for press fits (static)	75 N
28	Max. radial load, 5 mm from flange	20.5 N
	Other specifications	
29	Number of pole pairs	1
30	Number of commutator segments	13
31	Weight of motor	117 g

CLL = Capacitor Long Life

Values listed in the table are nominal.
Explanation of the figures on page 72.

Option
Ball bearings in place of sleeve bearings
Without CLL

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 34

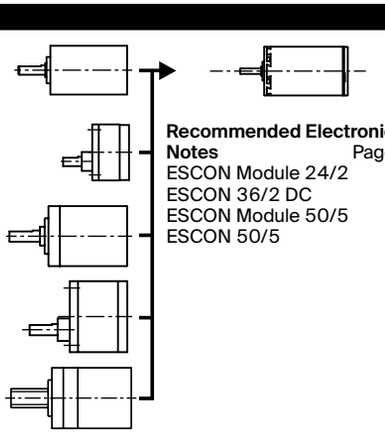
Planetary Gearhead
∅26 mm
0.75 - 4.5 Nm
Page 381

Spur Gearhead
∅30 mm
0.07 - 0.2 Nm
Page 382

Planetary Gearhead
∅32 mm
0.75 - 6.0 Nm
Page 383/384/387

Spur Gearhead
∅38 mm
0.1 - 0.6 Nm
Page 395

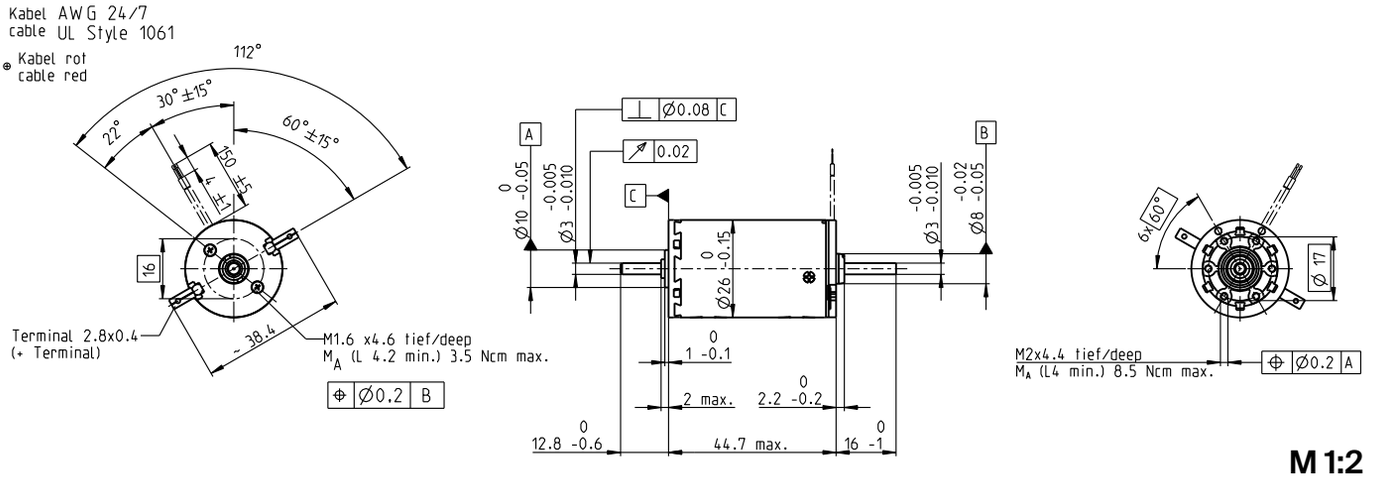
Screw Drive
∅32 mm
Page 416–421



Recommended Electronics:

Notes	Page 34
ESCON Module 24/2	486
ESCON 36/2 DC	486
ESCON Module 50/5	487
ESCON 50/5	489

A-max 26 ∅26 mm, Precious Metal Brushes CLL, 4.5 Watt



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

with terminals	110204	110205	110206	110207	110208	110209	110210	110211	110212	110213	110214	
with cables	353109	353110	353111	353112	353113	353114	353115	353116	353117	353118	353119	
Motor Data												
Values at nominal voltage												
1 Nominal voltage	V	2.4	3.6	6	7.2	9	12	15	18	24	30	36
2 No load speed	rpm	3890	5190	4090	4060	4020	4440	3530	3640	4510	4680	4520
3 No load current	mA	67.7	69.9	29.2	24	19	16.5	9.41	8.2	8.45	7.16	5.67
4 Nominal speed	rpm	3460	4640	2940	2650	2620	3030	2070	2180	3060	3210	3050
5 Nominal torque (max. continuous torque)	mNm	4.53	5.08	11.3	13.3	13.4	13.2	12.9	12.9	12.8	12.6	12.5
6 Nominal current (max. continuous current)	A	0.84	0.84	0.84	0.814	0.647	0.529	0.33	0.284	0.262	0.214	0.171
7 Stall torque	mNm	35.9	44.1	39.2	38.1	38.2	41.4	31.4	32.5	40.1	40.3	38.5
8 Stall current	A	6.15	6.71	2.83	2.27	1.8	1.62	0.783	0.697	0.797	0.665	0.513
9 Max. efficiency	%	81	81	81	81	81	81	80	80	81	81	81
Characteristics												
10 Terminal resistance	Ω	0.39	0.536	2.12	3.17	4.99	7.41	19.2	25.8	30.1	45.1	70.2
11 Terminal inductance	mH	0.0402	0.0509	0.227	0.332	0.528	0.77	1.9	2.57	2.99	4.34	6.68
12 Torque constant	mNm/A	5.84	6.57	13.9	16.8	21.2	25.5	40.1	46.7	50.3	60.6	75.2
13 Speed constant	rpm/V	1640	1450	689	569	451	374	238	205	190	158	127
14 Speed / torque gradient	rpm/mNm	109	119	105	108	106	108	114	113	114	117	119
15 Mechanical time constant	ms	16.6	16.1	15	14.9	14.9	14.9	14.9	14.9	14.9	15	15
16 Rotor inertia	gcm²	14.4	12.9	13.6	13.2	13.3	13.1	12.6	12.6	12.5	12.2	12.1

Specifications

Thermal data

17	Thermal resistance housing-ambient	13.2 K/W
18	Thermal resistance winding-housing	3.2 K/W
19	Thermal time constant winding	12.5 s
20	Thermal time constant motor	473 s
21	Ambient temperature	-30...+65°C
22	Max. winding temperature	+85°C

Mechanical data (sleeve bearings)

23	Max. speed	6700 rpm
24	Axial play	0.1 - 0.2 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	1.7 N
27	Max. force for press fits (static)	80 N
	(static, shaft supported)	1200 N
28	Max. radial load, 5 mm from flange	5.5 N

Mechanical data (ball bearings)

23	Max. speed	6700 rpm
24	Axial play	0.1 - 0.2 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	5.0 N
27	Max. force for press fits (static)	75 N
	(static, shaft supported)	1200 N
28	Max. radial load, 5 mm from flange	20.5 N

Other specifications

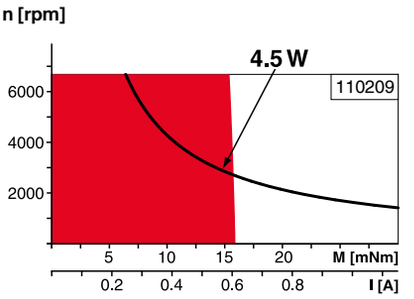
29	Number of pole pairs	1
30	Number of commutator segments	13
31	Weight of motor	119 g

CLL = Capacitor Long Life

Values listed in the table are nominal.
Explanation of the figures on page 72.

Option
Ball bearings in place of sleeve bearings
Without CLL

Operating Range



Comments

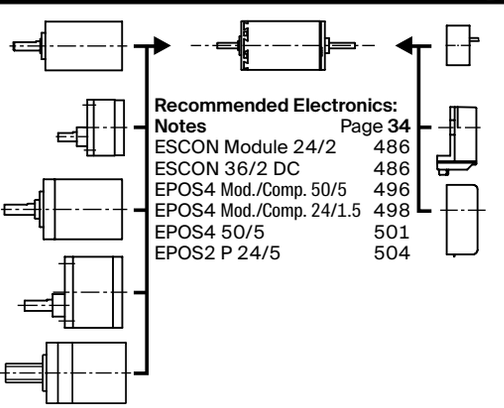
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 34



Planetary Gearhead
∅26 mm
0.75 - 4.5 Nm
Page 381

Spur Gearhead
∅30 mm
0.07 - 0.2 Nm
Page 382

Planetary Gearhead
∅32 mm
0.75 - 6.0 Nm
Page 383/384/387

Spur Gearhead
∅38 mm
0.1 - 0.6 Nm
Page 395

Screw Drive
∅32 mm
Page 416–421

Recommended Electronics:

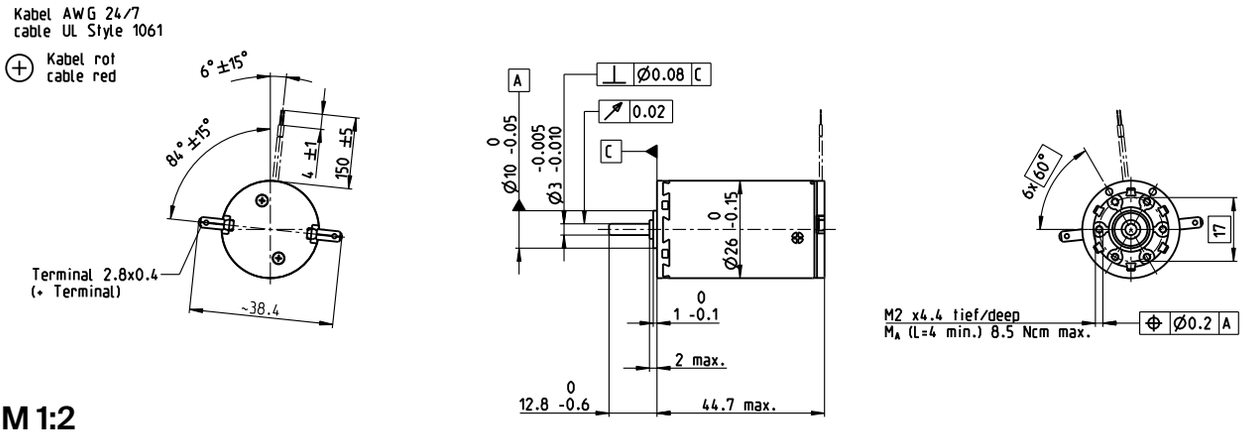
Notes	Page **34**
ESCON Module 24/2	486
ESCON 36/2 DC	486
EPOS4 Mod./Comp. 50/5	496
EPOS4 Mod./Comp. 24/1.5	498
EPOS4 50/5	501
EPOS2 P 24/5	504

Encoder MR
128 - 1000 CPT,
3 channels
Page 463

Encoder Enc
22 mm
100 CPT, 2 channels
Page 468

Encoder HED_ 5540
500 CPT,
3 channels
Page 472/474

A-max 26 ∅26 mm, Graphite Brushes, 11 Watt



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

with terminals	110935	110936	110937	110938	110939	**110940**	110941	110942	110943	110944	110945
with cables	139852	353166	353167	353168	353169	206344	353171	314214	202893	353174	353175

Motor Data												
	Values at nominal voltage											
1	Nominal voltage	V	6	7.2	12	15	18	24	30	36	42	48	48
2	No load speed	rpm	9740	10400	8190	8450	8040	8890	7050	7280	7880	7470	6010
3	No load current	mA	143	130	57	47.5	37.1	31.7	18.9	16.4	15.5	12.7	9.66
4	Nominal speed	rpm	9210	9700	6720	6620	6080	6910	5000	5230	5840	5390	3900
5	Nominal torque (max. continuous torque)	mNm	5.48	6.26	14.2	17.4	18.7	18.4	18.2	18.2	18.1	17.8	17.9
6	Nominal current (max. continuous current)	A	1.08	1.08	1.08	1.08	0.919	0.749	0.47	0.404	0.373	0.305	0.247
7	Stall torque	mNm	102	96.4	80.2	80.5	77.1	83.3	63	65.2	70.3	64.5	51.4
8	Stall current	A	17.4	14.7	5.79	4.8	3.64	3.26	1.57	1.4	1.4	1.06	0.684
9	Max. efficiency	%	83	82	81	81	81	82	80	80	80	80	78
	Characteristics												
10	Terminal resistance	Ω	0.345	0.49	2.07	3.13	4.94	7.36	19.1	25.8	30.1	45.1	70.2
11	Terminal inductance	mH	0.04	0.051	0.227	0.333	0.529	0.77	1.9	2.58	2.99	4.34	6.68
12	Torque constant	mNm/A	5.84	6.57	13.9	16.8	21.2	25.5	40.1	46.7	50.3	60.6	75.2
13	Speed constant	rpm/V	1640	1450	689	569	451	374	238	205	190	158	127
14	Speed / torque gradient	rpm/mNm	96.6	109	103	106	105	108	113	113	113	117	119
15	Mechanical time constant	ms	14.6	14.7	14.6	14.7	14.7	14.7	14.9	14.9	14.9	15	15
16	Rotor inertia	gcm²	14.4	12.9	13.6	13.2	13.3	13.1	12.5	12.6	12.5	12.2	12.1

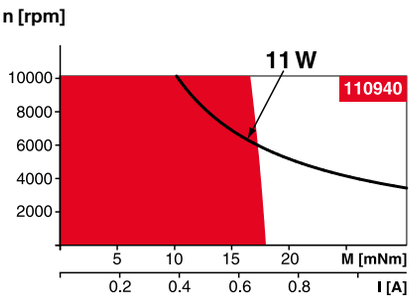
Specifications

	Thermal data	
17	Thermal resistance housing-ambient	13.2 K/W
18	Thermal resistance winding-housing	3.2 K/W
19	Thermal time constant winding	12.5 s
20	Thermal time constant motor	473 s
21	Ambient temperature	-30...+85°C
22	Max. winding temperature	+125°C
	Mechanical data (ball bearings)	
23	Max. speed	10400 rpm
24	Axial play	0.1 - 0.2 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	5 N
27	Max. force for press fits (static)	75 N
28	Max. radial load, 5 mm from flange	20 N
	Mechanical data (sleeve bearings)	
23	Max. speed	10400 rpm
24	Axial play	0.1 - 0.2 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	1.7 N
27	Max. force for press fits (static)	80 N
28	Max. radial load, 5 mm from flange	5.5 N
	Other specifications	
29	Number of pole pairs	1
30	Number of commutator segments	13
31	Weight of motor	117 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Option
Sleeve bearings in place of ball bearings

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 34

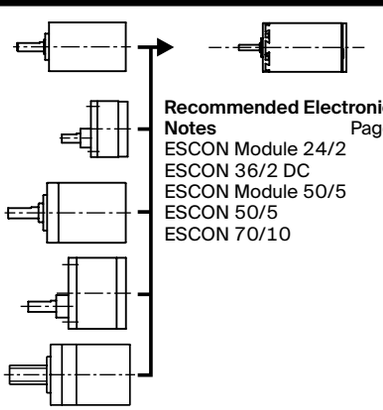
Planetary Gearhead
∅26 mm
0.75 - 4.5 Nm
Page 381

Spur Gearhead
∅30 mm
0.07 - 0.2 Nm
Page 382

Planetary Gearhead
∅32 mm
0.75 - 6.0 Nm
Page 383/384/387

Spur Gearhead
∅38 mm
0.1 - 0.6 Nm
Page 395

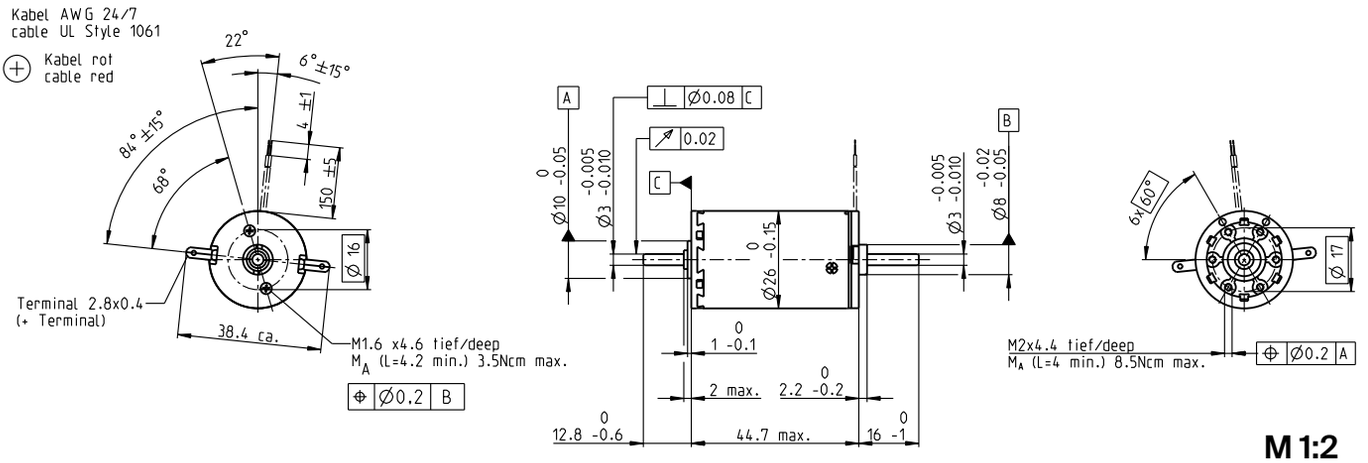
Screw Drive
∅32 mm
Page 416–421



Recommended Electronics:

Notes	Page **34**
ESCON Module 24/2	486
ESCON 36/2 DC	486
ESCON Module 50/5	487
ESCON 50/5	489
ESCON 70/10	489

A-max 26 ∅26 mm, Graphite Brushes, 11 Watt



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

with terminals	110958	110959	110960	110961	110962	110963	110964	110965	110966	110967	110968
with cables	353606	353607	353608	353609	353610	353611	353612	353613	353614	353615	353616

Motor Data

	Values at nominal voltage											
1	Nominal voltage	V	6	7.2	12	15	18	24	30	36	42	48	48
2	No load speed	rpm	9740	10400	8190	8450	8040	8890	7050	7280	7880	7470	6010
3	No load current	mA	143	130	57	47.5	37.1	31.7	18.9	16.4	15.5	12.7	9.66
4	Nominal speed	rpm	9210	9700	6720	6620	6080	6910	5000	5230	5840	5390	3900
5	Nominal torque (max. continuous torque)	mNm	5.48	6.26	14.2	17.4	18.7	18.4	18.2	18.2	18.1	17.8	17.9
6	Nominal current (max. continuous current)	A	1.08	1.08	1.08	1.08	0.919	0.749	0.47	0.404	0.373	0.305	0.247
7	Stall torque	mNm	102	96.4	80.2	80.5	77.1	83.3	63	65.2	70.3	64.5	51.4
8	Stall current	A	17.4	14.7	5.79	4.8	3.64	3.26	1.57	1.4	1.4	1.06	0.684
9	Max. efficiency	%	83	82	81	81	81	82	80	80	80	80	78
	Characteristics												
10	Terminal resistance	Ω	0.345	0.49	2.07	3.13	4.94	7.36	19.1	25.8	30.1	45.1	70.2
11	Terminal inductance	mH	0.04	0.051	0.227	0.333	0.529	0.77	1.9	2.58	2.99	4.34	6.68
12	Torque constant	mNm/A	5.84	6.57	13.9	16.8	21.2	25.5	40.1	46.7	50.3	60.6	75.2
13	Speed constant	rpm/V	1640	1450	689	569	451	374	238	205	190	158	127
14	Speed / torque gradient	rpm/mNm	96.6	109	103	106	105	108	113	113	113	117	119
15	Mechanical time constant	ms	14.6	14.7	14.6	14.7	14.7	14.7	14.9	14.9	14.9	15	15
16	Rotor inertia	gcm²	14.4	12.9	13.6	13.2	13.3	13.1	12.5	12.6	12.5	12.2	12.1

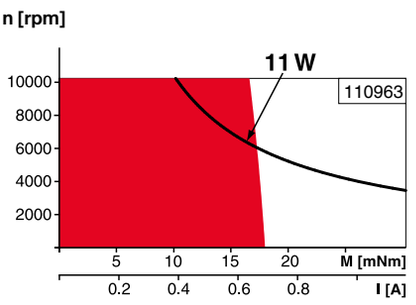
Specifications

	Thermal data	
17	Thermal resistance housing-ambient	13.2 K/W
18	Thermal resistance winding-housing	3.2 K/W
19	Thermal time constant winding	12.5 s
20	Thermal time constant motor	473 s
21	Ambient temperature	-30...+85°C
22	Max. winding temperature	+125°C
	Mechanical data (ball bearings)	
23	Max. speed	10400 rpm
24	Axial play	0.1 - 0.2 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	5 N
27	Max. force for press fits (static)	75 N
	(static, shaft supported)	1200 N
28	Max. radial load, 5 mm from flange	20 N
	Mechanical data (sleeve bearings)	
23	Max. speed	10400 rpm
24	Axial play	0.1 - 0.2 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	1.7 N
27	Max. force for press fits (static)	80 N
	(static, shaft supported)	1200 N
28	Max. radial load, 5 mm from flange	5.5 N
	Other specifications	
29	Number of pole pairs	1
30	Number of commutator segments	13
31	Weight of motor	119 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Option
Sleeve bearings in place of ball bearings

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 34

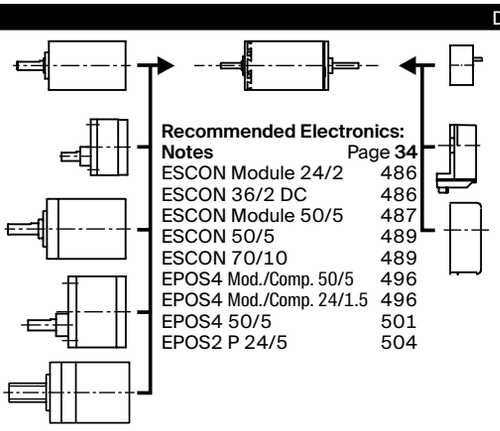
Planetary Gearhead
∅26 mm
0.75 - 4.5 Nm
Page 381

Spur Gearhead
∅30 mm
0.07 - 0.2 Nm
Page 382

Planetary Gearhead
∅32 mm
0.75 - 6.0 Nm
Page 383/384/387

Spur Gearhead
∅38 mm
0.1 - 0.6 Nm
Page 395

Screw Drive
∅32 mm
Page 416–421



Recommended Electronics:

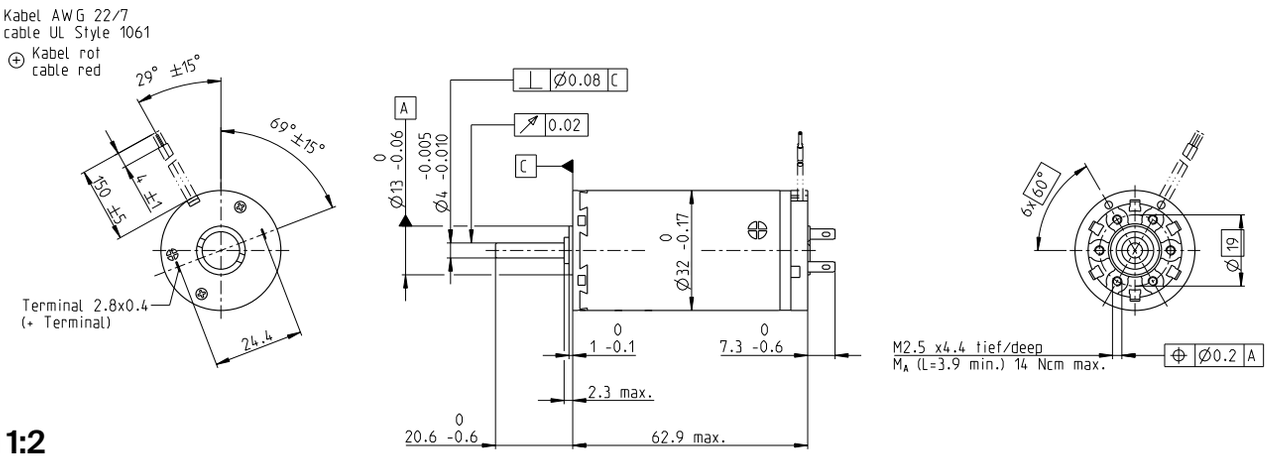
Notes	Page 34
ESCON Module 24/2	486
ESCON 36/2 DC	486
ESCON Module 50/5	487
ESCON 50/5	489
ESCON 70/10	489
EPOS4 Mod./Comp. 50/5	496
EPOS4 Mod./Comp. 24/1.5	496
EPOS4 50/5	501
EPOS2 P 24/5	504

Encoder MR
128 - 1000 CPT,
3 channels
Page 463

Encoder Enc
22 mm
100 CPT, 2 channels
Page 468

Encoder HED_ 5540
500 CPT,
3 channels
Page 472/474

A-max 32 ∅32 mm, Graphite Brushes, 20 Watt



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers							
with terminals	236659	236660	236661	**236662**	236663	236664	236665
with cables	353230	353231	353232	262500	341970	353233	353234

Motor Data								
	Values at nominal voltage							
1	Nominal voltage	V	6	9	12	24	30	36	42
2	No load speed	rpm	4880	5000	4670	6460	6160	5860	5650
3	No load current	mA	123	84.2	58.2	42.8	32.3	25.3	20.8
4	Nominal speed	rpm	3400	3480	3170	5060	4740	4430	4210
5	Nominal torque (max. continuous torque)	mNm	44.5	43.1	44	45.5	45.1	45.4	45
6	Nominal current (max. continuous current)	A	3.96	2.62	1.87	1.33	1.01	0.804	0.659
7	Stall torque	mNm	153	146	140	212	197	189	178
8	Stall current	A	13.2	8.57	5.77	6.02	4.27	3.24	2.54
9	Max. efficiency	%	80	80	80	84	83	83	83
	Characteristics							
10	Terminal resistance	Ω	0.454	1.05	2.08	3.99	7.02	11.1	16.6
11	Terminal inductance	mH	0.06	0.13	0.264	0.556	0.954	1.52	2.22
12	Torque constant	mNm/A	11.6	17	24.3	35.2	46.1	58.2	70.4
13	Speed constant	rpm/V	825	562	394	271	207	164	136
14	Speed / torque gradient	rpm/mNm	32.4	34.8	33.8	30.8	31.6	31.3	31.9
15	Mechanical time constant	ms	15	14.9	14.7	14.6	14.6	14.6	14.7
16	Rotor inertia	gcm²	44.2	40.8	41.7	45.3	44.2	44.6	43.8

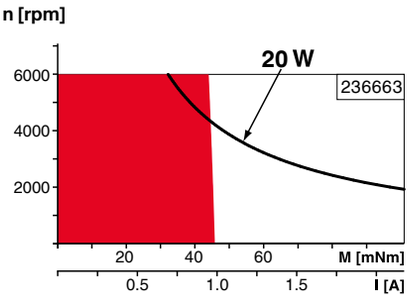
Specifications

	Thermal data	
17	Thermal resistance housing-ambient	7.5 K/W
18	Thermal resistance winding-housing	2.1 K/W
19	Thermal time constant winding	17.8 s
20	Thermal time constant motor	521 s
21	Ambient temperature	-20...+85°C
22	Max. winding temperature	+125°C
	Mechanical data (ball bearings)	
23	Max. speed	6000 rpm
24	Axial play	0.12 - 0.22 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	7.6 N
27	Max. force for press fits (static)	110 N
28	Max. radial load, 5 mm from flange	32 N
	Mechanical data (sleeve bearings)	
23	Max. speed	6000 rpm
24	Axial play	0.12 - 0.22 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	5 N
27	Max. force for press fits (static)	110 N
28	Max. radial load, 5 mm from flange	10.5 N
	Other specifications	
29	Number of pole pairs	1
30	Number of commutator segments	13
31	Weight of motor	240 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Option
Sleeve bearings in place of ball bearings

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

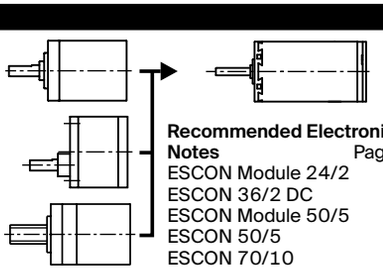
maxon Modular System

Details on catalog page 34

Planetary Gearhead
∅32 mm
0.75 - 6.0 Nm
Page 383–385/387–388

Spur Gearhead
∅38 mm
0.1 - 0.6 Nm
Page 395

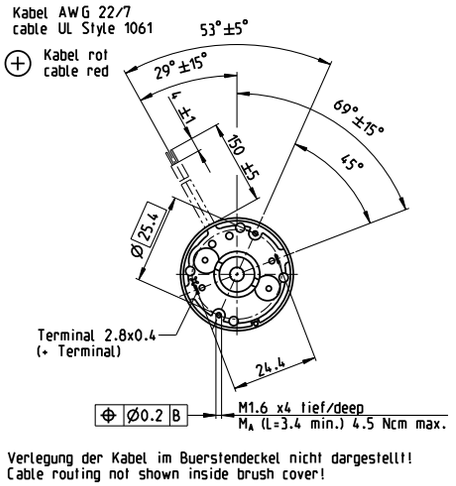
Screw Drive
∅32 mm
Page 416–421

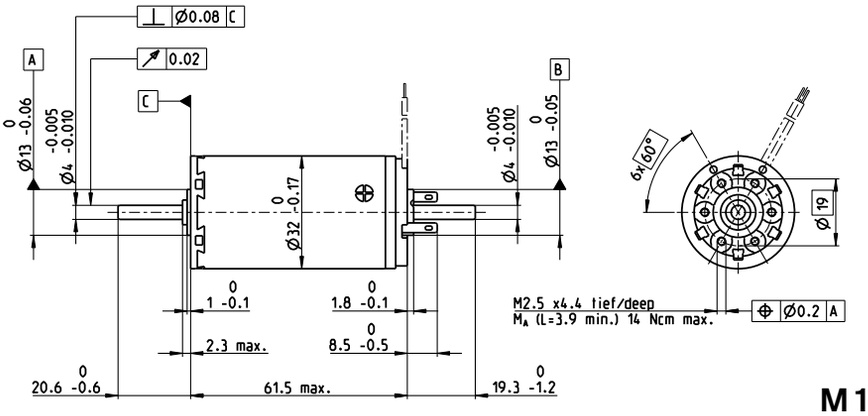


Recommended Electronics:

Notes	Page **34**
ESCON Module 24/2	486
ESCON 36/2 DC	486
ESCON Module 50/5	487
ESCON 50/5	489
ESCON 70/10	489

A-max 32 ∅32 mm, Graphite Brushes, 20 Watt





M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

with terminals	236666	236667	236668	236669	**236670**	236671	236672
with cables	353236	353237	301030	353239	353240	353241	353242

Motor Data

	Values at nominal voltage								
1	Nominal voltage	V	6	9	12	24	30	36	42
2	No load speed	rpm	4880	5000	4670	6460	6160	5860	5650
3	No load current	mA	123	84.2	58.2	42.8	32.3	25.3	20.8
4	Nominal speed	rpm	3400	3480	3170	5060	4740	4430	4210
5	Nominal torque (max. continuous torque)	mNm	44.5	43.1	44	45.5	45.1	45.4	45
6	Nominal current (max. continuous current)	A	3.96	2.62	1.87	1.33	1.01	0.804	0.659
7	Stall torque	mNm	153	146	140	212	197	189	178
8	Stall current	A	13.2	8.57	5.77	6.02	4.27	3.24	2.54
9	Max. efficiency	%	80	80	80	84	83	83	83
	Characteristics								
10	Terminal resistance	Ω	0.454	1.05	2.08	3.99	7.02	11.1	16.6
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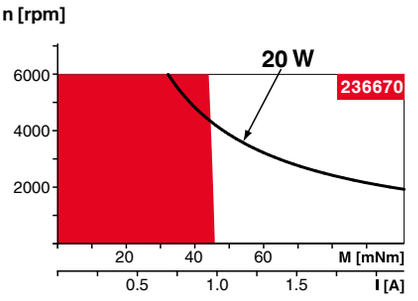
	Mechanical data (ball bearings)	
23	Max. speed	6000 rpm
24	Axial play	0.12 - 0.22 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	7.6 N
27	Max. force for press fits (static)	110 N
	(static, shaft supported)	2000 N
28	Max. radial load, 5 mm from flange	32 N
	Mechanical data (sleeve bearings)	
23	Max. speed	6000 rpm
24	Axial play	0.12 - 0.22 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	5.0 N
27	Max. force for press fits (static)	110 N
	(static, shaft supported)	2000 N
28	Max. radial load, 5 mm from flange	10.5 N
	Other specifications	
29	Number of pole pairs	1
30	Number of commutator segments	13
31	Weight of motor	240 g

Values listed in the table are nominal.
Explanation of the figures on page 72.

Option
Sleeve bearings in place of ball bearings

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 34

Planetary Gearhead
∅32 mm
0.75 - 6.0 Nm
Page 383–385/387–388

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∅38 mm
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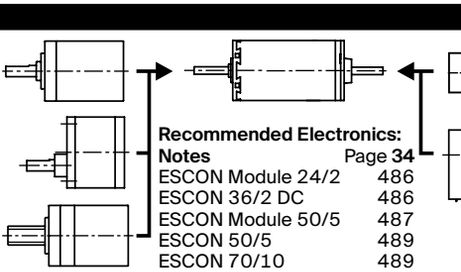
Screw Drive
∅32 mm
Page 416–421



Recommended Electronics:

Notes	Page 34
ESCON Module 24/2	486
ESCON 36/2 DC	486
ESCON Module 50/5	487
ESCON 50/5	489
ESCON 70/10	489
EPOS4 Mod./Comp. 50/5	496
EPOS4 Mod./Comp. 24/1.5	496
EPOS4 50/5	501
EPOS2 P 24/5	504

Encoder MR
256 - 1024 CPT,
3 channels
Page 464

Encoder HED_ 5540
500 CPT,
3 channels
Page 472/474

Brushless DC motors (BLDC) with ironless or iron core windings

Explanations of maxon terminology EC motor

maxon

Dimensional drawings
Presentation of the views according to the projection method E (ISO). 
All dimensions in [mm].

Motor Data
The values in lines 2 – 15 are valid when using block commutation.

1 Nominal voltage U_N [Volt]
is the applied voltage between two powered phases in block commutation. See page 46 for the timing diagram of the voltage in the three phases. All nominal data (lines 2 – 9) refer to this voltage. Lower and higher voltages are permissible, provided that limits are not exceeded.

2 No load speed n_0 [rpm] ±10%
is the speed at which the unloaded motor runs with the nominal voltage applied. It is approximately proportional to the applied voltage.

3 No load current I_0 [mA] ±50%
This is the typical current that the unloaded motor draws when operating at nominal voltage. It increases with rising speed owing to bearing friction and iron losses. No load friction depends heavily on temperature. It decreases in extended operation and increases at lower temperatures.

4 Nominal speed n_N [rpm]
is the speed set for operation at nominal voltage and nominal torque at a motor temperature of 25°C.

5 Nominal torque M_N [mNm]
is the torque generated for operation at nominal voltage and nominal current at a motor temperature of 25°C. It is at the limit of the motor's continuous operation range. Higher torques heat up the winding too much.

6 Nominal current I_N [A]
is the current in the active phase in block commutation that generates the nominal torque at the given nominal speed (= max. permissible continuous load current). The maximum winding temperature is reached at 25°C ambient temperature in continuous operation with I_N. I_N decreases as speed increases due to additional losses in the lamination.

7 Stall torque M_H [mNm]
is the linearly calculated load torque for motors that causes the shaft to stall at nominal voltage. With EC-flat and EC-i motors, this torque often cannot be achieved due to saturation effects.

8 Stall current I_A [A]
is the quotient from nominal voltage and the motor's terminal resistance. Stall current is equivalent to stall torque. With larger motors, I_A cannot often be reached due to the amplifier's current limits.

9 Max. efficiency η_{max} [%]
is the calculated load torque that brings the shaft to standstill at nominal voltage. It also doesn't always denote the optimal operating point.

10 Terminal resistance phase to phase R [Ω]
is determined by the resistance at 25 °C between two connections of the standard resolution.

11 Terminal inductance phase to phase L [mH]
is the winding inductance between two connections. It is measured at 1 kHz, sinusoidal.

12 Torque constant k_M [mNm/A]
This may also be referred to as «specific torque» and represents the quotient from generated torque and applicable current.

13 Speed constant k_n [rpm/V]
indicates the theoretical no load speed per volt of applied voltage, disregarding friction losses.

14 Speed/torque gradient
Δ_n/Δ_M [rpm/mNm]
The speed/torque gradient is an indicator of the motor's performance. The smaller the value, the more powerful the motor and consequently the less motor speed varies with load variations. It is based on the quotient of ideal no load speed and ideal stall torque (tolerance ± 20%).
The real characteristic curve depends on the speed for EC motors with slotted winding (EC flat and EC-i); it is steeper at high speeds and flatter at slow speeds. The real gradient at nominal voltage can be approximated by a straight line between no load speed and the nominal operating point (see page 61).

15 Mechanical time constant τ_m [ms]
is the time required for the rotor to accelerate from standstill to 63% of its no load speed.

16 Rotor moment of inertia J_R [gcm²]
is the mass moment of inertia of the rotor, based on the axis of rotation.

17 Thermal resistance housing-ambient R_{th2} [K/W]
and
18 Thermal resistance winding-housing R_{th1} [K/W]
Characteristic values of thermal contact resistance without additional heat sinking. Lines 17 and 18 combined define the maximum heating at a given power loss (load). Thermal resistance R_{th2} on motors with metal flanges can decrease by up to 80% if the motor is coupled directly to a good heat-conducting (e.g. metallic) mounting rather than a plastic panel.

19 Thermal time constant winding τ_w [s]
and
20 Thermal time constant motor τ_s [s]
These are the typical reaction times for a temperature change of winding and motor. It can be seen that the motor reacts much more sluggishly in thermal terms than the winding. The values are calculated from the product of thermal capacity and given heat resistances.

21 Ambient temperature [°C]
Operating temperature range. This derives from the heat reliability of the materials used and viscosity of bearing lubrication.

22 Max. winding temperature [°C]
Maximum permissible winding temperature.

23 Max. speed n_{max} [rpm]
is the maximum recommended speed based on thermal and mechanical perspectives. A reduced service life can be expected at higher speeds.

24 Axial play [mm]
On motors that are not preloaded, these are the tolerance limits for the bearing play. A preload cancels out the axial play up to the specified axial force. When load is applied in the direction of the preload force (away from the flange), the axial play is always zero. The length tolerance of the shaft includes the maximum axial play.

25 Radial play [mm]
Radial play is the bearing's radial movement. A spring is utilized to preload the motor's bearings, eliminating radial play up to a given axial load.

26/27 Max. axial load [N]
Dynamically: axial loading permissible in operation. If different values apply for traction and thrust, the smaller value is given.
Statically: maximum axial force applying to the shaft at standstill where no residual damage occurs.
Shaft supported: maximum axial force applying to the shaft at standstill if the force is not input at the other shaft end. This is not possible for motors with only one shaft end.

28 Max. radial load [N]
The value is given for a typical clearance from the flange; this value falls the greater the clearance.

29 Number of pole pairs
Number of north poles of the permanent magnet. The phase streams and commutation signals pass through per revolution p cycles. Servo-controllers require the correct details of the number of pole pairs.

30 Number of phases
All maxon EC motors have three phases.

31 Weight of motor [g]

32 Typical noise level [dBA]
is that statistical average of the noise level measured according to maxon standard (10 cm distance radially to the drive, no load operation at a speed of 6,000 or 50,000 rpm. The drive lies freely on a plastic foam mat in the noise chamber).
The acoustic noise level depends on a number of factors, such as component tolerances, and it is greatly influenced by the overall system in which the drive is installed. When the drive is installed in an unfavorable constellation, the noise level may be significantly higher than the noise level of the drive alone.
The acoustic noise level is measured and determined during product qualification. In manufacturing, a structure-borne noise test is performed with defined limits. Impermissible deviations can thus be identified.

33 Max. torque M_{max} [mNm]
Maximum torque the motor can briefly deliver. It is limited by the overload protection of the electronics.

34 Max. current I_{max} [A]
Surge current with which the peak torque is generated at nominal voltage. With an active speed controller, surge current is not proportionate to the torque, but also depends on the supply voltage. As a result, this value only applies at nominal voltage.

35 Type of control
«Speed» means that the drive is fitted with an integral speed controller. «Controlled» means that the drive is fitted with true commutation electronics.

36 Supply voltage $+V_{CC}$ [V]
Range of supply voltages measured in respect of GND at which the drive functions.

37 Speed set value input U_C [V]
Range of analog voltage for set speed value measured in respect of GND. For 2 wire solutions, the supply voltage acts as speed setting at the same time.

38 Scaling Set speed value input k_c [rpm/V]
Set speed value n_c is based on the product $n_c = k_c \cdot U_c$.

39 Speed range
Achievable speeds in the controlled range.

40 Max. acceleration
The set speed value follows a sudden set point change with a ramp. This value indicates the increase in the ramp.

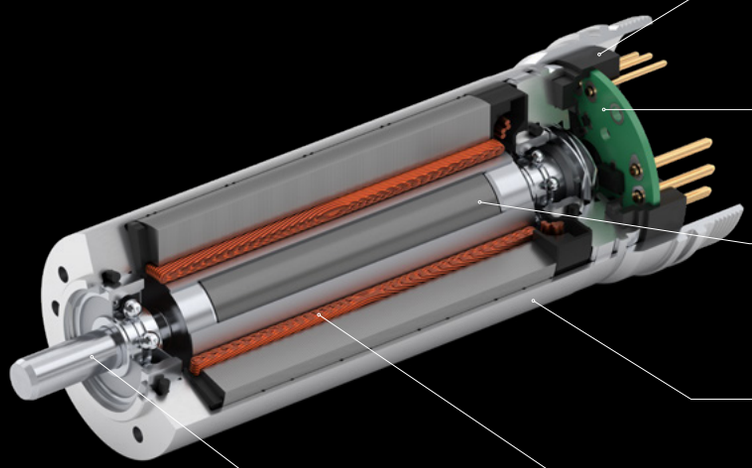
maxon ECX SPEED

maxon ECX SPEED

The brushless ECX SPEED series of motors has been optimized for high speeds (up to 120 000 rpm). Depending on the application, different versions are available: Standard, high power, sterilizable (up to 2000 cycles) or with ceramic bearings for very high speed. Select your mechanical and electrical interface online. The ECX program is fully configurable and is ready for shipping in 11 working days.

Key data

Motor ∅	4 ... 22 mm
Motor length	19 ... 60 mm
Power	0.5 ... 120 W
Nominal torque	up to 29 mNm
Max. permissible speed	up to 120 000 rpm



Electrical connection with single wires, flexprint or as pluggable pin solution, depending on the size.

Variety of sensor options can be integrated: temperature sensor, hall elements, encoder.

Balanced rotor, 2-pole and with top-quality magnets — encapsulated in the sterilizable version.

Motor housing including mounting flange as a single part, stainless steel and non-magnetic.

Highly efficient ironless winding, system maxon – potted in sterilizable version.

Stainless steel shaft with high stiffness – various modification options available.

- → Extremely fast and quiet
- → Autoclavable up to 2000 times (sterilizable version)
- → Low noise and low vibration
- → The ironless winding with no cogging torque
- → Minimal heat build-up
- → Easily configured online

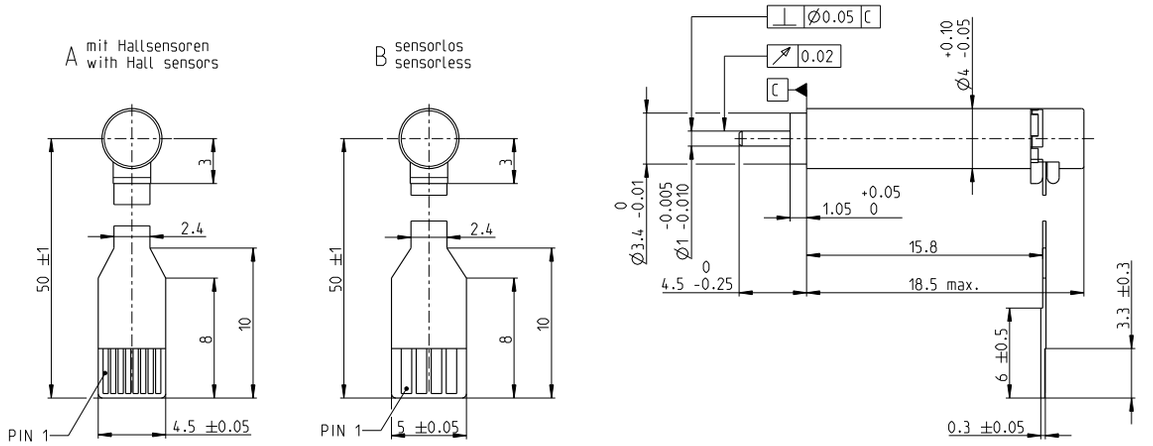
shop.maxongroup.com

ECX SPEED 4 M brushless
BLDC motor ∅4 mm

NEW

ECX SPEED

Key Data: 1.5/1.0 W, 0.23 mNm, 50 000 rpm



M 2:1

	Motor Data			
1_	Nominal voltage	V	3	6
2_	No load speed	rpm	35200	35400
3_	No load current	mA	28.8	14.4
4_	Nominal speed	rpm	11700	13400
5_	Nominal torque (max. continuous torque)	mNm	0.225	0.239
6_	Nominal current (max. continuous current)	A	0.317	0.167
7_	Stall torque	mNm	0.355	0.403
8_	Stall current	A	0.465	0.264
9_	Max. efficiency	%	57	59.3
10_	Terminal resistance	Ω	6.45	22.8
11_	Terminal inductance	mH	0.0749	0.285
12_	Torque constant	mNm/A	0.763	1.53
13_	Speed constant	rpm/V	12500	6240
14_	Speed/torque gradient	rpm/mNm	106000	92900
15_	Mechanical time constant	ms	1.23	1.08
16_	Rotor inertia	gcm²	0.00111	0.00111

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	96.7
18_	Thermal resistance winding-housing	K/W	15.2
19_	Thermal time constant winding	s	0.738
20_	Thermal time constant motor	s	58.5
21_	Ambient temperature	°C	-20 ... +80
22_	Max. winding temperature	°C	125

	Mechanical data		
23_	Max. speed	rpm	50 000
24_	Max. Axial play	mm	0.06
	Preload	N	-
	Direction of force		-
25_	Radial play		0.012
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	10
	(static, shaft supported)	N	10
28_	Max. radial load [mm from flange]	N	0.2 [2]

	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	1.2
32_	Typical noise level [rpm]	dBA	46 [50 000]

Connection motor with hall sensor (A)
FPC Flexprint 8-pole, pitch 0.5 mm

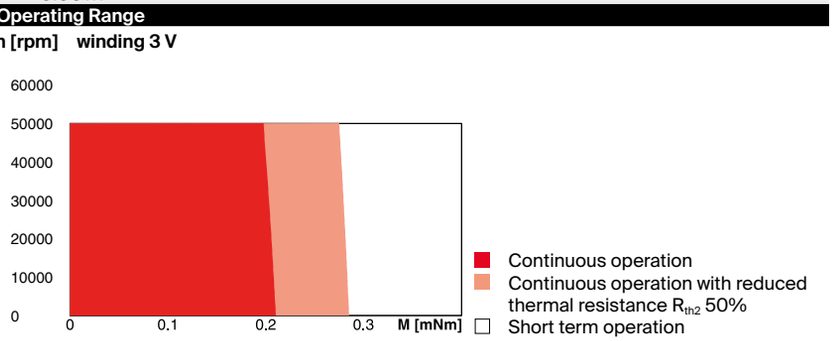
Pin 1	Motor winding 1
Pin 2	Motor winding 2
Pin 3	Motor winding 3
Pin 4	V_{Hall} 2.5...5.5 VDC
Pin 5	GND
Pin 6	Hall sensor 1
Pin 7	Hall sensor 2
Pin 8	Hall sensor 3

Output signals: CMOS compatible push-pull stage
Output current per channel: max. 0.5 mA

Connection motor sensorless (B)
FPC flexprint 4-pole, pitch 1.0 mm:

Pin 1	Motor winding 1
Pin 2	Motor winding 2
Pin 3	Motor winding 3
Pin 4	N.C.

Operating Range



maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
320_GPX 4 C	2–4	for motor type A: 428_ENX 4 MAG	486_ESCON Module 24/2 487_ESCON 36/3 EC 487_ESCON Module 50/4 EC-S 491_DEC Module 24/2 498_EPOS4 Mod./Comp. 24/1.5

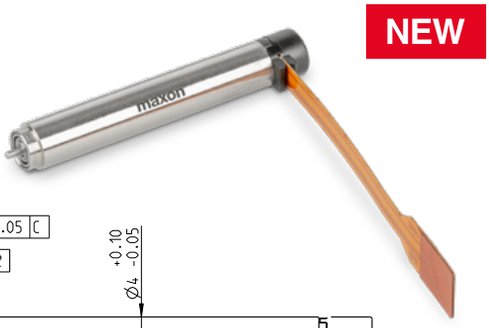
Configuration
Shaft front: length/diameter
Electrical connection: Flex cable/round cable

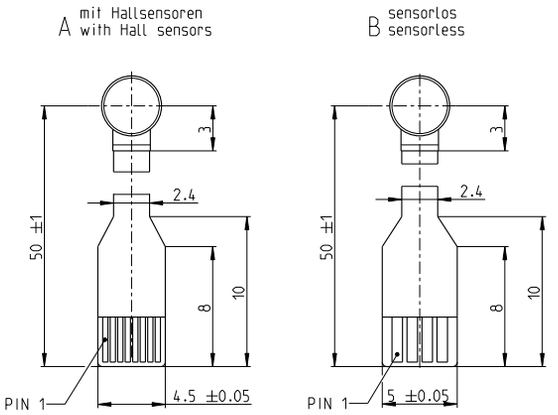
xdrives.maxongroup.com

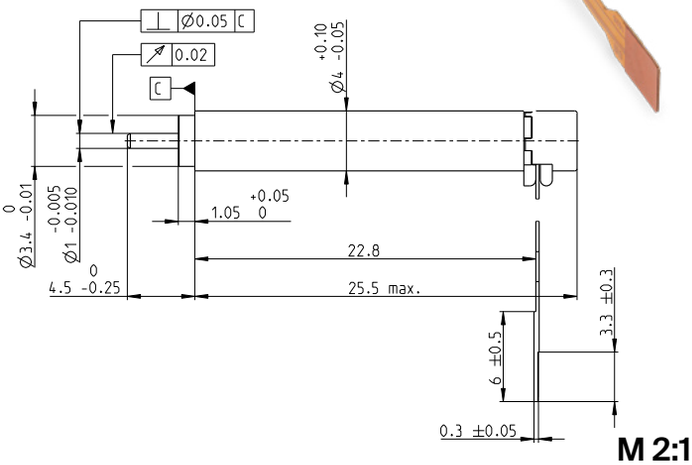
ECX SPEED 4 L brushless
BLDC motor ∅4 mm

NEW

Key Data: 1.0/1.6 W, 0.34 mNm, 50 000 rpm







M 2:1

	Motor Data			
1_	Nominal voltage	V	3	6
2_	No load speed	rpm	40700	30500
3_	No load current	mA	55.6	18.9
4_	Nominal speed	rpm	23000	13400
5_	Nominal torque (max. continuous torque)	mNm	0.338	0.341
6_	Nominal current (max. continuous current)	A	0.545	0.206
7_	Stall torque	mNm	0.817	0.641
8_	Stall current	A	1.22	0.36
9_	Max. efficiency	%	62.6	60
10_	Terminal resistance	Ω	2.46	16.7
11_	Terminal inductance	mH	0.0458	0.323
12_	Torque constant	mNm/A	0.67	1.78
13_	Speed constant	rpm/V	14300	5360
14_	Speed/torque gradient	rpm/mNm	52300	50200
15_	Mechanical time constant	ms	0.903	0.867
16_	Rotor inertia	gcm²	0.00165	0.00165

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	84
18_	Thermal resistance winding-housing	K/W	16.7
19_	Thermal time constant winding	s	1.31
20_	Thermal time constant motor	s	76.4
21_	Ambient temperature	°C	-20 ... +80
22_	Max. winding temperature	°C	125

	Mechanical data		
23_	Max. speed	rpm	50 000
24_	Max. Axial play	mm	0.06
	Preload	N	-
	Direction of force		-
25_	Radial play		0.012
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	10
	(static, shaft supported)	N	10
28_	Max. radial load [mm from flange]	N	0.2 [2]

	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	1.8
32_	Typical noise level [rpm]	dBA	47 [50 000]

Connection motor with hall sensor (A)
FPC Flexprint 8-pole, pitch 0.5 mm

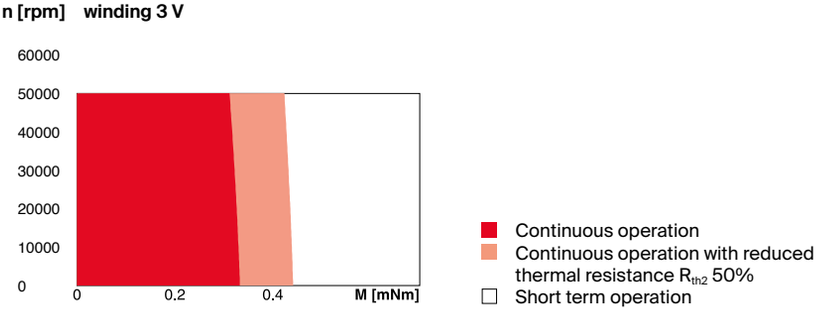
Pin 1	Motor winding 1
Pin 2	Motor winding 2
Pin 3	Motor winding 3
Pin 4	V_{Hall} 2.5...5.5 VDC
Pin 5	GND
Pin 6	Hall sensor 1
Pin 7	Hall sensor 2
Pin 8	Hall sensor 3

Output signals: CMOS compatible push-pull stage
Output current per channel: max. 0.5 mA

Connection motor sensorless (B)
FPC flexprint 4-pole, pitch 1.0 mm:

Pin 1	Motor winding 1
Pin 2	Motor winding 2
Pin 3	Motor winding 3
Pin 4	N.C.

Operating Range



maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
320_GPX 4 C	2–4	for motor type A: 428_ENX 4 MAG	486_ESCON Module 24/2 487_ESCON 36/3 EC 487_ESCON Module 50/4 EC-S 491_DEC Module 24/2 498_EPOS4 Mod./Comp. 24/1.5

Configuration

Shaft front: length/diameter
Electrical connection: Flex cable/round cable

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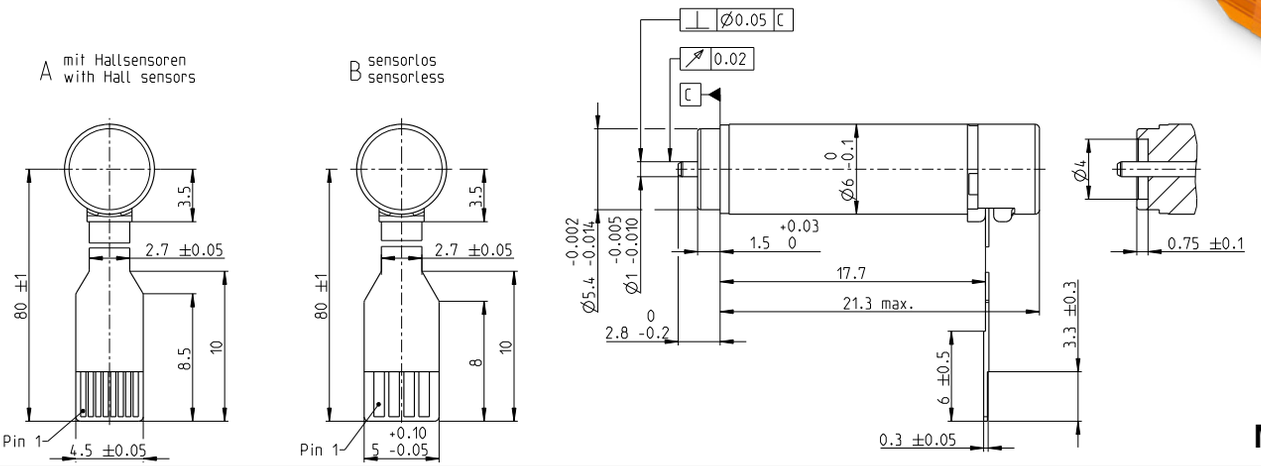
April 2020 edition / provisional data / subject to change

ECX SPEED 6 M brushless
BLDC motor ∅6 mm

Key Data: 1.5/3.0 W, 0.33 mNm, 100 000 rpm

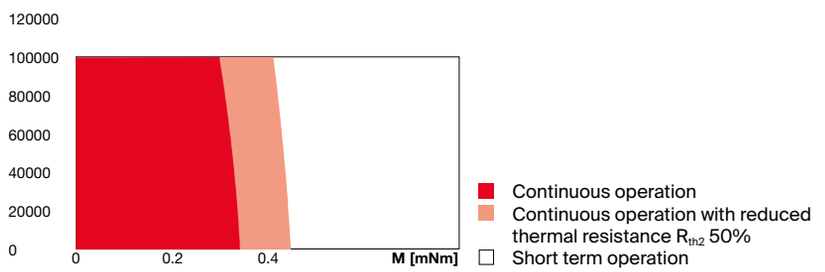


M 2:1

	Motor Data			
1_	Nominal voltage	V	6	12
2_	No load speed	rpm	44200	33300
3_	No load current	mA	46.5	16.2
4_	Nominal speed	rpm	25500	13900
5_	Nominal torque (max. continuous torque)	mNm	0.334	0.322
6_	Nominal current (max. continuous current)	A	0.314	0.116
7_	Stall torque	mNm	0.832	0.59
8_	Stall current	A	0.688	0.188
9_	Max. efficiency	%	55.6	50.4
10_	Terminal resistance	Ω	8.72	63.8
11_	Terminal inductance	mH	0.0652	0.436
12_	Torque constant	mNm/A	1.21	3.14
13_	Speed constant	rpm/V	7900	3040
14_	Speed/torque gradient	rpm/mNm	57000	61800
15_	Mechanical time constant	ms	4.2	4.55
16_	Rotor inertia	gcm²	0.00703	0.00703
	Thermal data			
17_	Thermal resistance housing-ambient	K/W	67.1	
18_	Thermal resistance winding-housing	K/W	16.8	
19_	Thermal time constant winding	s	1.69	
20_	Thermal time constant motor	s	71.8	
21_	Ambient temperature	°C	-20...+100	
22_	Max. winding temperature	°C	125	
	Mechanical data ball bearings			
23_	Max. speed	rpm	100 000	
24_	Axial play	mm	0.. 0.07	
	Preload	N	0.15	
	Direction of force		pull	
25_	Radial play		preloaded	
26_	Max. axial load (dynamic)	N	0.1	
27_	Max. force for press fits (static)	N	10	
	(static, shaft supported)	N	110	
28_	Max. radial load [mm from flange]	N	2 [2]	
	Other specifications			
29_	Number of pole pairs		1	
30_	Number of phases		3	
31_	Weight of motor	g	3	
32_	Typical noise level [rpm]	dBA	44 [50 000]	

Operating Range

n [rpm] winding 6 V



maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
321_GPX 6 A	1–5	for motor type A: 429_ENX 6 MAG	486_ESCON Module 24/2 487_ESCON 36/3 EC 487_ESCON Module 50/4 EC-S 491_DEC Module 24/2 498_EPOS4 Mod./Comp. 24/1.5

Configuration

Shaft front: length

Connection motor with hall sensor (A)
FPC Flexprint 8-pole, pitch 0.5 mm

Pin 1	Motor winding 1
Pin 2	Motor winding 2
Pin 3	Motor winding 3
Pin 4	V_{Hall} 2.5...5.5 VDC
Pin 5	GND
Pin 6	Hall sensor 1
Pin 7	Hall sensor 2
Pin 8	Hall sensor 3

Output signals: CMOS compatible push-pull stage Output
Output current per channel: max. 0.5 mA

Connection motor sensorless (B)
FPC flexprint 4-pole, pitch 1.0 mm:

Pin 1	Motor winding 1
Pin 2	Motor winding 2
Pin 3	Motor winding 3
Pin 4	N.C.

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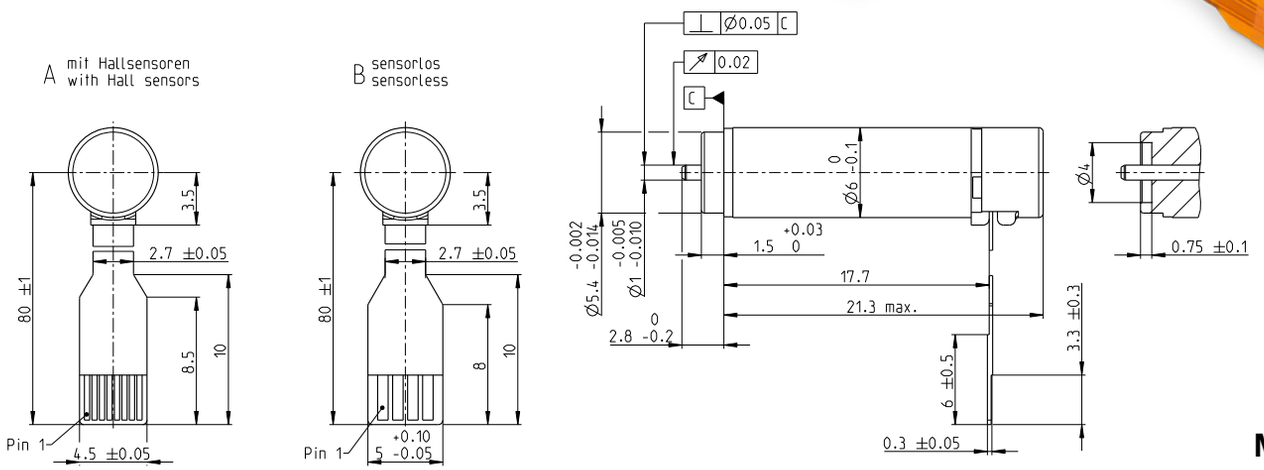
ECX SPEED 6 M brushless
BLDC motor ∅6 mm
High Power

Key Data: 2.0/4.0 W, 0.42 mNm, 100 000 rpm



M 2:1

	Motor Data				
1_	Nominal voltage	V	3	6	12
2_	No load speed	rpm	74400	62700	63400
3_	No load current	mA	149	58.8	29.8
4_	Nominal speed	rpm	52300	44900	46800
5_	Nominal torque (max. continuous torque)	mNm	0.413	0.412	0.425
6_	Nominal current (max. continuous current)	A	1.24	0.517	0.268
7_	Stall torque	mNm	1.45	1.52	1.7
8_	Stall current	A	3.92	1.72	0.97
9_	Max. efficiency	%	65.5	66.9	68.5
10_	Terminal resistance	Ω	0.766	3.49	12.4
11_	Terminal inductance	mH	0.00529	0.0301	0.118
12_	Torque constant	mNm/A	0.37	0.882	1.75
13_	Speed constant	rpm/V	25800	10800	5460
14_	Speed/torque gradient	rpm/mNm	53400	42800	38500
15_	Mechanical time constant	ms	3.93	3.15	2.84
16_	Rotor inertia	gcm²	0.00703	0.00703	0.00703

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	65.8
18_	Thermal resistance winding-housing	K/W	13.2
19_	Thermal time constant winding	s	1.34
20_	Thermal time constant motor	s	70.4
21_	Ambient temperature	°C	-20...+100
22_	Max. winding temperature	°C	125

	Mechanical data ball bearings		
23_	Max. speed	rpm	100 000
24_	Axial play	mm	0.. 0.07
	Preload	N	0.15
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	10
	(static, shaft supported)	N	110
28_	Max. radial load [mm from flange]	N	2 [2]

	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	3
32_	Typical noise level [rpm]	dBA	44 [50 000]

Connection motor with hall sensor (A)
FPC Flexprint 8-pole, pitch 0.5 mm

Pin 1	Motor winding 1
Pin 2	Motor winding 2
Pin 3	Motor winding 3
Pin 4	V_{Hall} 2.5...5.5 VDC
Pin 5	GND
Pin 6	Hall sensor 1
Pin 7	Hall sensor 2
Pin 8	Hall sensor 3

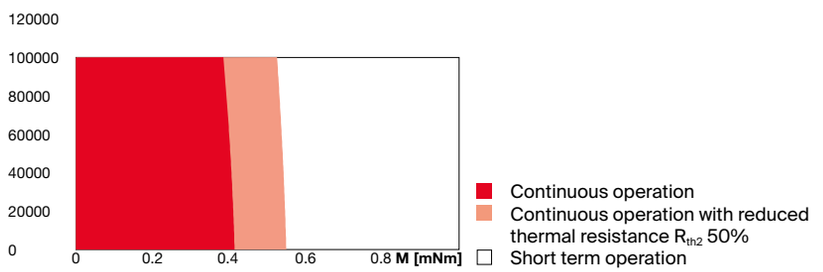
Output signals: CMOS compatible push-pull stage
Output Output current per channel: max. 0.5 mA

Connection motor sensorless (B)
FPC flexprint 4-pole, pitch 1.0 mm:

Pin 1	Motor winding 1
Pin 2	Motor winding 2
Pin 3	Motor winding 3
Pin 4	N.C.

Operating Range

n [rpm] winding 6 V



maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
321_GPX 6 A	1–5	for motor type A: 429_ENX 6 MAG	486_ESCON Module 24/2 487_ESCON 36/3 EC 487_ESCON Module 50/4 EC-S 491_DEC Module 24/2 498_EPOS4 Mod./Comp. 24/1.5

Configuration

Shaft front: length

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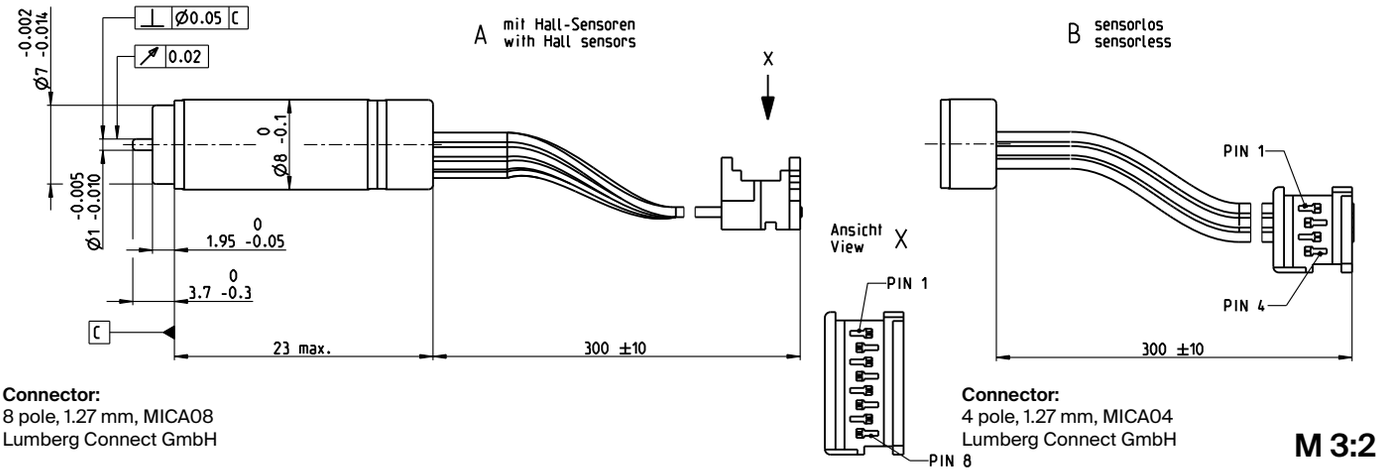
ECX SPEED 8 M brushless
BLDC motor ∅8 mm

Key Data: 2/4.7 W, 0.98 mNm, 50 000 rpm



Connector:
8 pole, 1.27 mm, MICA08
Lumberg Connect GmbH

Connector:
4 pole, 1.27 mm, MICA04
Lumberg Connect GmbH

M 3:2

	Motor Data				
1_	Nominal voltage	V	6	12	24
2_	No load speed	rpm	35400	43300	42200
3_	No load current	mA	105	69.0	33.2
4_	Nominal speed	rpm	24200	33100	32300
5_	Nominal torque (max. continuous torque)	mNm	0.917	0.874	0.877
6_	Nominal current (max. continuous current)	A	0.687	0.406	0.198
7_	Stall torque	mNm	3.04	3.88	3.92
8_	Stall current	A	1.98	1.54	0.755
9_	Max. efficiency	%	61	63	64
10_	Terminal resistance	Ω	3.02	7.8	31.8
11_	Terminal inductance	mH	0.039	0.106	0.447
12_	Torque constant	mNm/A	1.53	2.51	5.19
13_	Speed constant	rpm/V	6230	3780	1840
14_	Speed/torque gradient	rpm/mNm	12300	11700	11300
15_	Mechanical time constant	ms	3.21	3.06	2.95
16_	Rotor inertia	gcm²	0.0249	0.0249	0.0249

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	51.2
18_	Thermal resistance winding-housing	K/W	3.5
19_	Thermal time constant winding	s	0.811
20_	Thermal time constant motor	s	154
21_	Ambient temperature	°C	-20...+85
22_	Max. winding temperature	°C	+125

	Mechanical data ball bearings		
23_	Max. speed	rpm	50 000
24_	Axial play	mm	0...0.07
	Preload	N	0.3
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	0.2
27_	Max. force for press fits (static)	N	10
	(static, shaft supported)	N	110
28_	Max. radial load [mm from flange]	N	2 [2]

	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	6
32_	Typical noise level [rpm]	dBA	49 [50 000]

Connection A (flat band cable AWG 28, pitch 1.27 mm)

Pin 1	Motor winding 1
Pin 2	Motor winding 2
Pin 3	Motor winding 3
Pin 4	V_{Hall} 1.6...5.5 VDC
Pin 5	GND
Pin 6	Hall sensor 1
Pin 7	Hall sensor 2
Pin 8	Hall sensor 3

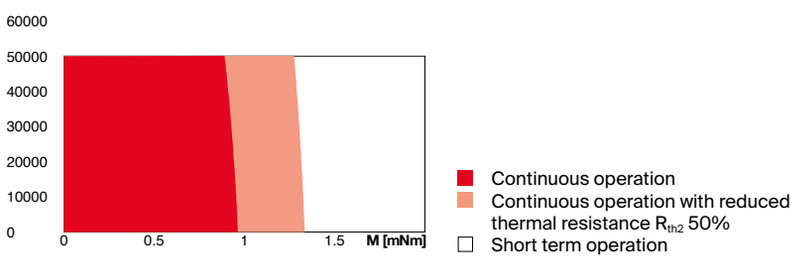
Output signal: CMOS compatible
Output current per channel: max 0.5 mA

Connection B (flat band cable AWG 28, pitch 1.27 mm)

Pin 1	Motor winding 1
Pin 2	Motor winding 2
Pin 3	Motor winding 3
Pin 4	N.C.

Operating Range

n [rpm] Winding 12 V



maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
322_GPX 8 A	1–5	for motor type A:	486_ESCON Module 24/2
		430_ENX 8 MAG	487_ESCON 36/3 EC
		for motor type A + B:	487_ESCON Module 50/4 EC-S
		431_ENX 8 EASY INT	491_DEC Module 24/2
		432_ENX 8 EASY INT Abs.	496_EPOS4 Mod./Comp. 24/1.5

Configuration

Shaft front: length
Electric connection: flex or cable, cable length
Cable insulation: PVC/PO/FEP

[1] For type A:
PVC-cable (-20...85°C)
PO- and FEP cable (-30...85°C)
For type B:
PVC-cable (-20...100°C)
PO- and FEP cable (-40...100°C)

Cable and plug configuration:
Adapter Micromotor (Part number 498157)
required for all maxon controllers.

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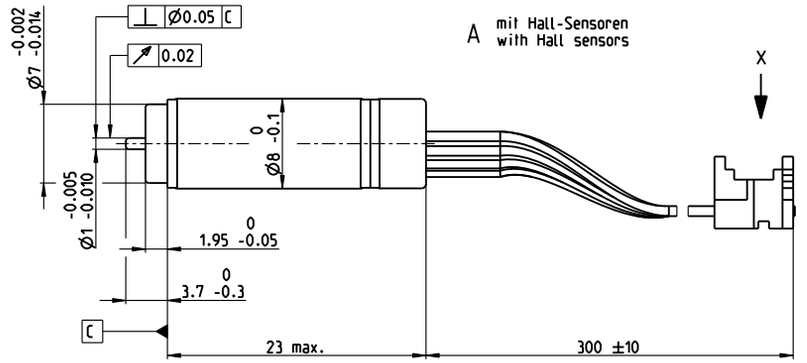
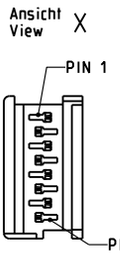
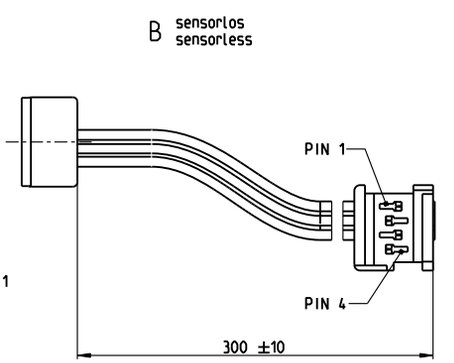
ECX SPEED 8 M brushless
BLDC motor ∅8 mm

High Power

Key Data: 3/6 W, 1.26 mNm, 50 000 rpm







Connector:
8 pole, 1.27 mm, MICA08
Lumberg Connect GmbH

Connector:
4 pole, 1.27 mm, MICA04
Lumberg Connect GmbH

M 3:2

	Motor Data				
1_	Nominal voltage	V	6	9	12
2_	No load speed	rpm	35500	29100	30500
3_	No load current	mA	128	63.4	50.9
4_	Nominal speed	rpm	26700	21200	22800
5_	Nominal torque (max. continuous torque)	mNm	1.23	1.26	1.26
6_	Nominal current (max. continuous current)	A	0.902	0.497	0.391
7_	Stall torque	mNm	5.18	4.83	5.18
8_	Stall current	A	3.34	1.7	1.43
9_	Max. efficiency	%	66	66	67
10_	Terminal resistance	Ω	1.8	5.3	8.38
11_	Terminal inductance	mH	0.026	0.089	0.144
12_	Torque constant	mNm/A	1.55	2.84	3.62
13_	Speed constant	rpm/V	6160	3360	2640
14_	Speed/torque gradient	rpm/mNm	7130	6260	6110
15_	Mechanical time constant	ms	1.86	1.64	1.6
16_	Rotor inertia	gcm²	0.0249	0.0249	0.0249

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	51.2
18_	Thermal resistance winding-housing	K/W	4.11
19_	Thermal time constant winding	s	0.874
20_	Thermal time constant motor	s	154
21_	Ambient temperature	°C	-20...+85
22_	Max. winding temperature	°C	+125
	Mechanical data ball bearings		
23_	Max. speed	rpm	50 000
24_	Axial play	mm	0...0.07
	Preload	N	0.3
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	0.2
27_	Max. force for press fits (static)	N	10
	(static, shaft supported)	N	110
28_	Max. radial load [mm from flange]	N	2 [2]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	6
32_	Typical noise level [rpm]	dBA	49 [50 000]

Connection A (flat band cable AWG 28, pitch 1.27 mm)

Pin 1	Motor winding 1
Pin 2	Motor winding 2
Pin 3	Motor winding 3
Pin 4	V_{Hall} 1.6...5.5 VDC
Pin 5	GND
Pin 6	Hall sensor 1
Pin 7	Hall sensor 2
Pin 8	Hall sensor 3

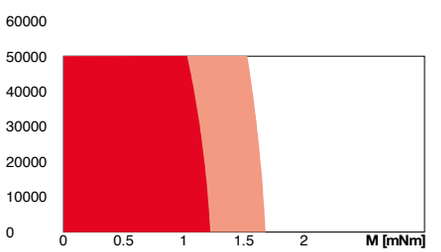
Output signal: CMOS compatible
Output current per channel: max 0.5 mA

Connection B (flat band cable AWG 28, pitch 1.27 mm)

Pin 1	Motor winding 1
Pin 2	Motor winding 2
Pin 3	Motor winding 3
Pin 4	N.C.

Operating Range

n [rpm] Winding 9 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Short term operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
322_GPX 8 A	1–5	for motor type A:	486_ESCON Module 24/2
		430_ENX 8 MAG	487_ESCON 36/3 EC
		for motor type A + B:	487_ESCON Module 50/4 EC-S
		431_ENX 8 EASY INT	491_DEC Module 24/2
		432_ENX 8 EASY INT Abs.	496_EPOS4 Mod./Comp. 24/1.5

Configuration

Shaft front: length
Electric connection: flex or cable, cable length
Cable insulation: PVC/PO/FEP

[1] For type A:
PVC-cable (-20...85°C)
PO- and FEP cable (-30...85°C)
For type B:
PVC-cable (-20...100°C)
PO- and FEP cable (-40...100°C)

Cable and plug configuration:
Adapter Micromotor (Part number 498157)
required for all maxon controllers.

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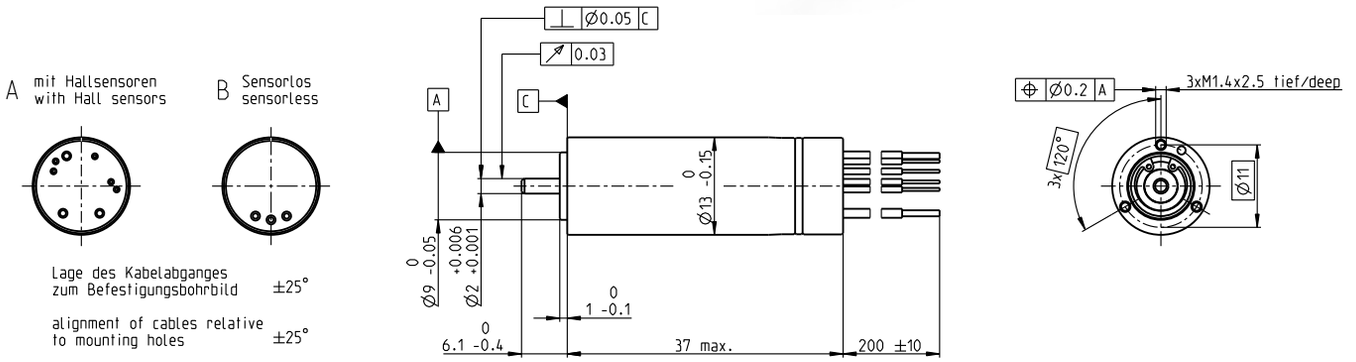
ECX SPEED 13 M brushless
BLDC motor ∅13 mm

Key Data: 12/12.8 W, 2.7 mNm, 50 000 rpm



M 1:1

	Motor Data					
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	44700	44500	43300	43700
3_	No load current	mA	206	154	98.1	74.7
4_	Nominal speed	rpm	40000	40000	38600	38900
5_	Nominal torque (max. continuous torque)	mNm	2.73	2.74	2.63	2.58
6_	Nominal current (max. continuous current)	A	0.916	0.687	0.431	0.321
7_	Stall torque	mNm	28	28.4	25.5	25.2
8_	Stall current	A	7.49	5.68	3.32	2.48
9_	Max. efficiency	%	71	71	70	69
10_	Terminal resistance	Ω	2.4	4.22	10.9	19.3
11_	Terminal inductance	mH	0.0652	0.117	0.276	0.483
12_	Torque constant	mNm/A	3.74	5	7.69	10.2
13_	Speed constant	rpm/V	2560	1910	1240	939
14_	Speed/torque gradient	rpm/mNm	1640	1610	1750	1790
15_	Mechanical time constant	ms	4.2	4.12	4.48	4.56
16_	Rotor inertia	gcm²	0.244	0.244	0.244	0.244

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	29.5
18_	Thermal resistance winding-housing	K/W	2.21
19_	Thermal time constant winding	s	1.31
20_	Thermal time constant motor	s	355
21_	Ambient temperature	°C	-20...+100
22_	Max. winding temperature	°C	155

	Mechanical data ball bearings		
23_	Max. speed	rpm	50 000
24_	Axial play	mm	0...0.28
	Preload	N	1.5
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	1.5
27_	Max. force for press fits (static)	N	50
	(static, shaft supported)	N	1500
28_	Max. radial load [mm from flange]	N	6 [5]

	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	24.1
32_	Typical noise level [rpm]	dBA	46 [50 000]

Connection A and B, motor (Cable AWG A: 26, B: 22)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

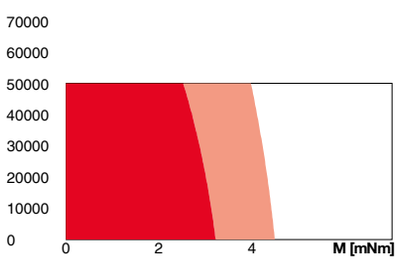
Connection A, sensors (Cable AWG 28)

orange	V_{CC} 5 ±0.5 V
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Output signals: CMOS compatible push-pull stage. No pull-up resistor required. Hall signals are generated by an EASY INT sensor. In combination with the ENX EASY INT, the orange (V_{CC}) and blue (GND) connections are not used.

Operating Range

n [rpm] winding 36 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Short term operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
327_GPX 13 SPEED	1–3	for motor type A:	486_ESCON Module 24/2
328_GPX 14 A/C	1–2 [3–4]	435_ENX 13 EASY INT	487_ESCON 36/3 EC
329_GPX 14 LN/LZ	1–2 [3–4]	for motor type B:	487_ESCON Module 50/4 EC-S
330_GPX 14 HP	2–3 [4]	435_ENX 13 EASY INT Abs.	487_ESCON Module 50/5
331_GPX 16 A/C	3–4		489_ESCON 50/5
332_GPX 16 LN/LZ	3–4		491_DEC Module 24/2
333_GPX 16 HP	4		491_DEC Module 50/5
			495_EPOS4 Micro 24/5
			496_EPOS4 Mod./Comp. 24/1.5
			496_EPOS4 Mod./Comp. 50/5
			497_EPOS4 Comp. 24/5 3-axes
			501_EPOS4 50/5
			504_EPOS2 P 24/5

Configuration

Flange front: thread holes/center thread
Flange back: metal ring/external thread
Shaft front: length/diameter
Electric connection: cable length/pin connection/connector
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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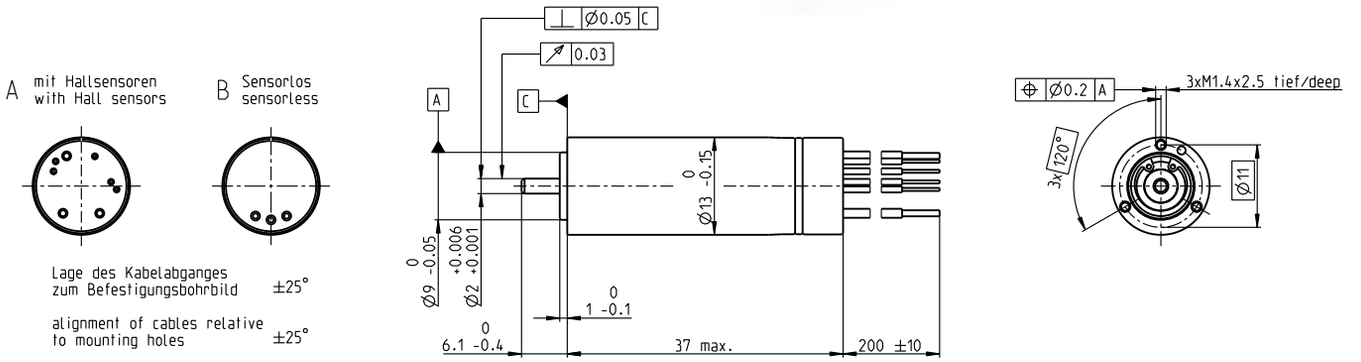
ECX SPEED 13 M brushless
BLDC motor ∅13 mm
High Power

Key Data: 25/29.7 W, 4.3 mNm, 70 000 rpm



M 1:1

	Motor Data					
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	66700	66700	66700	64000
3_	No load current	mA	273	205	137	95.6
4_	Nominal speed	rpm	62700	63000	63000	60400
5_	Nominal torque (max. continuous torque)	mNm	4.33	4.3	4.04	4.22
6_	Nominal current (max. continuous current)	A	1.95	1.45	0.917	0.682
7_	Stall torque	mNm	79.8	83.9	79	80.3
8_	Stall current	A	31.3	24.7	15.5	11.3
9_	Max. efficiency	%	82.6	83	82.6	82.9
10_	Terminal resistance	Ω	0.576	0.973	2.33	4.24
11_	Terminal inductance	mH	0.0178	0.0316	0.0711	0.137
12_	Torque constant	mNm/A	2.55	3.4	5.11	7.09
13_	Speed constant	rpm/V	3740	2810	1870	1350
14_	Speed/torque gradient	rpm/mNm	843	802	853	805
15_	Mechanical time constant	ms	2.15	2.05	2.18	2.06
16_	Rotor inertia	gcm²	0.244	0.244	0.244	0.244

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	29.5
18_	Thermal resistance winding-housing	K/W	2.53
19_	Thermal time constant winding	s	1.71
20_	Thermal time constant motor	s	558
21_	Ambient temperature	°C	-20...+100
22_	Max. winding temperature	°C	155

	Mechanical data ball bearings		
23_	Max. speed	rpm	70 000
24_	Axial play	mm	0...0.28
	Preload	N	1.5
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	1.5
27_	Max. force for press fits (static)	N	50
	(static, shaft supported)	N	1500
28_	Max. radial load [mm from flange]	N	6 [5]

	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	37.8
32_	Typical noise level [rpm]	dBA	46 [50 000]

Connection A and B, motor (Cable AWG A: 26, B: 22)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

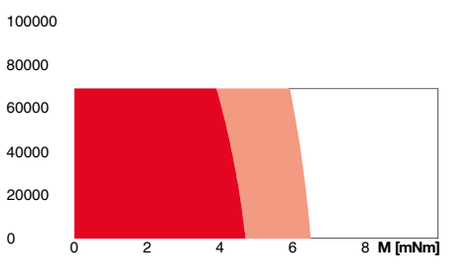
Connection A, sensors (Cable AWG 28)

orange	V_{CC} 5 ±0.5 V
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Output signals: CMOS compatible push-pull stage. No pull-up resistor required. Hall signals are generated by an EASY INT sensor. In combination with the ENX EASY INT, the orange (V_{CC}) and blue (GND) connections are not used.

Operating Range

n [rpm] winding 36 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Short term operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor
327_GPX 13 SPEED	1–3	for motor type A:
328_GPX 14 A/C	1–2 [3–4]	435_ENX 13 EASY INT
329_GPX 14 LN/LZ	1–2 [3–4]	for motor type B:
330_GPX 14 HP	2–3 [4]	435_ENX 13 EASY INT Abs.
331_GPX 16 A/C	3–4	
332_GPX 16 LN/LZ	3–4	
333_GPX 16 HP	4	

maxon motor control

- 486_ESCON Module 24/2
- 487_ESCON 36/3 EC
- 487_ESCON Module 50/4 EC-S
- 487_ESCON Module 50/5
- 489_ESCON 50/5
- 491_DEC Module 24/2
- 491_DEC Module 50/5
- 495_EPOS4 Micro 24/5
- 496_EPOS4 Mod./Comp. 50/5
- 497_EPOS4 Comp. 24/5 3-axes
- 498_EPOS4 Mod./Comp. 24/1.5
- 501_EPOS4 50/5
- 504_EPOS2 P 24/5

Configuration

Flange front: thread holes/center thread
Flange back: metal ring/external thread
Shaft front: length/diameter
Electric connection: cable length/pin connection/connector
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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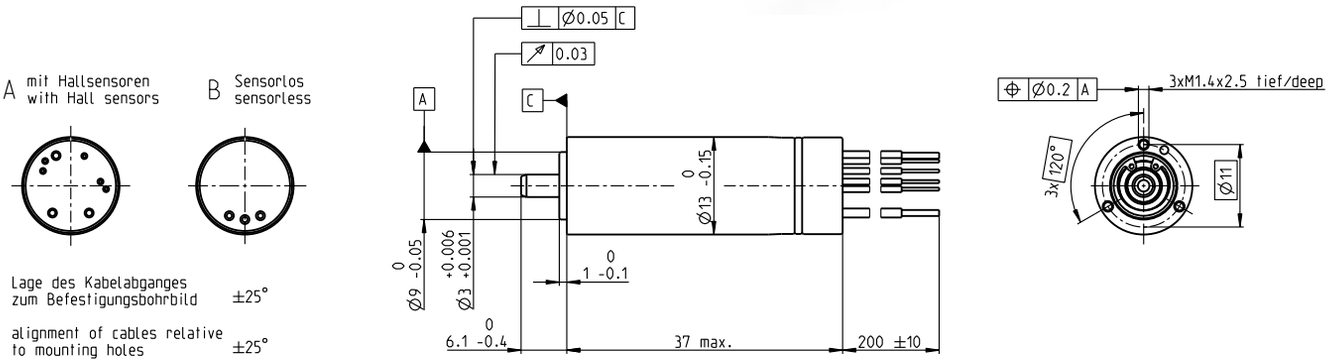
ECX SPEED 13 M brushless
BLDC motor ∅13 mm
Sterilizable

Key Data: 25/25 W, 3.3 mNm, 90 000 rpm



M 1:1

	Motor Data					
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	77600	77600	77600	74500
3_	No load current	mA	208	156	104	72.9
4_	Nominal speed	rpm	74300	74500	74500	71300
5_	Nominal torque (max. continuous torque)	mNm	2.67	2.64	2.48	2.73
6_	Nominal current (max. continuous current)	A	1.41	1.05	0.663	0.517
7_	Stall torque	mNm	68.8	72.3	68.1	69.2
8_	Stall current	A	31.3	24.7	15.5	11.3
9_	Max. efficiency	%	85	85	85	85
10_	Terminal resistance	Ω	0.576	0.973	2.33	4.24
11_	Terminal inductance	mH	0.0135	0.024	0.054	0.104
12_	Torque constant	mNm/A	2.2	2.93	4.4	6.11
13_	Speed constant	rpm/V	4340	3260	2170	1560
14_	Speed/torque gradient	rpm/mNm	1140	1080	1150	1080
15_	Mechanical time constant	ms	1.55	1.47	1.56	1.48
16_	Rotor inertia	gcm²	0.13	0.13	0.13	0.13

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	29.5
18_	Thermal resistance winding-housing	K/W	2.5
19_	Thermal time constant winding	s	1.69
20_	Thermal time constant motor	s	475
21_	Ambient temperature	°C	-40...+135
22_	Max. winding temperature	°C	155

	Mechanical data ball bearings		
23_	Max. speed	rpm	90 000
24_	Axial play	mm	0...0.28
	Preload	N	1.5
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	1.5
27_	Max. force for press fits (static)	N	50
	(static, shaft supported)	N	1500
28_	Max. radial load [mm from flange]	N	6 [5]

	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	32
32_	Typical noise level [rpm]	dBA	46 [50 000]

Connection A and B, motor (Cable AWG A: 26, B: 22)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

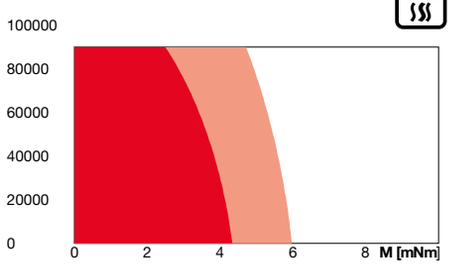
Connection A, sensors (Cable AWG 28)

orange	V_{CC} 5 ±0.5 V
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Output signals: CMOS compatible push-pull stage. No pull-up resistor required. Hall signals are generated by an EASY INT sensor. In combination with the ENX EASY INT, the orange (V_{CC}) and blue (GND) connections are not used.

Operating Range

n [rpm] winding 36 V



Sterilization information

Sterilization cycles
Sensorless: typical 2000
Hall sensors: typical 1000

Sterilization with steam

Temperature	+134°C ±4°C
Compression pressure up to	2.3 bar
Rel. humidity	100%
Cycle length	18 min.

- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Short term operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
327_GPX 13 SPEED	1–3	for motor type A: 435_ENX 13 EASY INT for motor type B: 435_ENX 13 EASY INT Abs.	486_ESCON Module 24/2 487_ESCON 36/3 EC 487_ESCON Module 50/4 EC-S 487_ESCON Module 50/5 489_ESCON 50/5 491_DEC Module 24/2 491_DEC Module 50/5 495_EPOS4 Micro 24/5 496_EPOS4 Mod./Comp. 24/1.5 496_EPOS4 50/5 496_EPOS4 Mod./Comp. 50/5 497_EPOS4 Comp. 24/5 3-axes 504_EPOS2 P 24/5

Configuration

Flange front: thread holes/center thread
Flange back: metal ring/external thread
Shaft front: length/diameter
Electric connection: cable length/pin connection
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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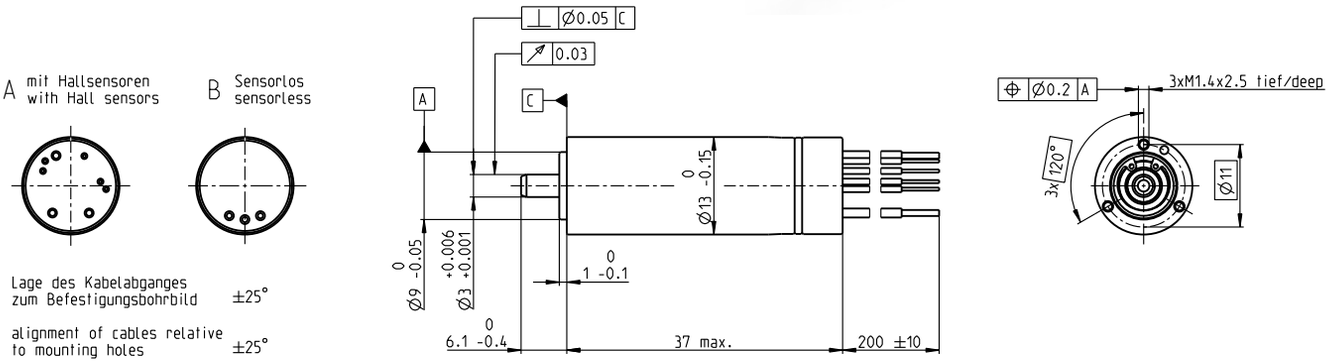
ECX SPEED 13 M brushless
BLDC motor ∅13 mm

Sterilizable, Ceramic Bearings

Key Data: 25/27 W, 3.6 mNm, 120 000 rpm



M 1:1

	Motor Data					
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	77600	77600	77600	74500
3_	No load current	mA	186	140	93.3	65.7
4_	Nominal speed	rpm	73900	74100	74200	71000
5_	Nominal torque (max. continuous torque)	mNm	3.02	2.99	2.8	3.03
6_	Nominal current (max. continuous current)	A	1.55	1.15	0.724	0.557
7_	Stall torque	mNm	68.8	72.3	68.1	69.2
8_	Stall current	A	31.3	24.7	15.5	11.3
9_	Max. efficiency	%	85	86	85	86
10_	Terminal resistance	Ω	0.576	0.973	2.33	4.24
11_	Terminal inductance	mH	0.0135	0.024	0.054	0.104
12_	Torque constant	mNm/A	2.2	2.93	4.4	6.11
13_	Speed constant	rpm/V	4340	3260	2170	1560
14_	Speed/torque gradient	rpm/mNm	1140	1080	1150	1080
15_	Mechanical time constant	ms	1.55	1.47	1.56	1.48
16_	Rotor inertia	gcm²	0.13	0.13	0.13	0.13

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	29.5
18_	Thermal resistance winding-housing	K/W	2.5
19_	Thermal time constant winding	s	1.69
20_	Thermal time constant motor	s	475
21_	Ambient temperature	°C	-40...+135
22_	Max. winding temperature	°C	155

	Mechanical data ball bearings		
23_	Max. speed	rpm	120 000
24_	Axial play	mm	0...0.28
	Preload	N	1.5
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	1.5
27_	Max. force for press fits (static)	N	50
	(static, shaft supported)	N	1500
28_	Max. radial load [mm from flange]	N	6 [5]

	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	32
32_	Typical noise level [rpm]	dBA	46 [50 000]

Connection A and B, motor (Cable AWG A: 26, B: 22)

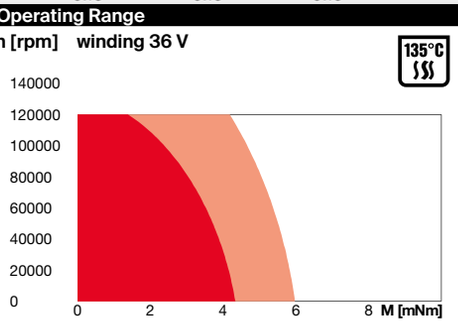
red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors (Cable AWG 28)

orange	V_{CC} 5 ±0.5 V
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Output signals: CMOS compatible push-pull stage. No pull-up resistor required. Hall signals are generated by an EASY INT sensor. In combination with the ENX EASY INT, the orange (V_{CC}) and blue (GND) connections are not used.

Operating Range



Sterilization information

135°C SS

Sterilization cycles
Sensorless: typical 2000
Hall sensors: typical 1000

Sterilization with steam

Temperature	+134°C ±4°C
Compression pressure up to	2.3 bar
Rel. humidity	100%
Cycle length	18 min.

- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Short term operation

maxon Modular System

Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
327_GPX 13 SPEED	1–3	for motor type A: 435_ENX 13 EASY INT for motor type B: 435_ENX 13 EASY INT Abs.	486_ESCON Module 24/2 487_ESCON 36/3 EC 487_ESCON Module 50/4 EC-S 487_ESCON Module 50/5 489_ESCON 50/5 491_DEC Module 24/2 491_DEC Module 50/5 495_EPOS4 Micro 24/5 496_EPOS4 Mod./Comp. 50/5 496_EPOS4 Mod./Comp. 24/1.5 497_EPOS4 Comp. 24/5 3-axes 501_EPOS4 50/5 504_EPOS2 P 24/5

Configuration

Flange front: thread holes/center thread
Flange back: metal ring/external thread
Shaft front: length/diameter
Electric connection: cable length/pin connection
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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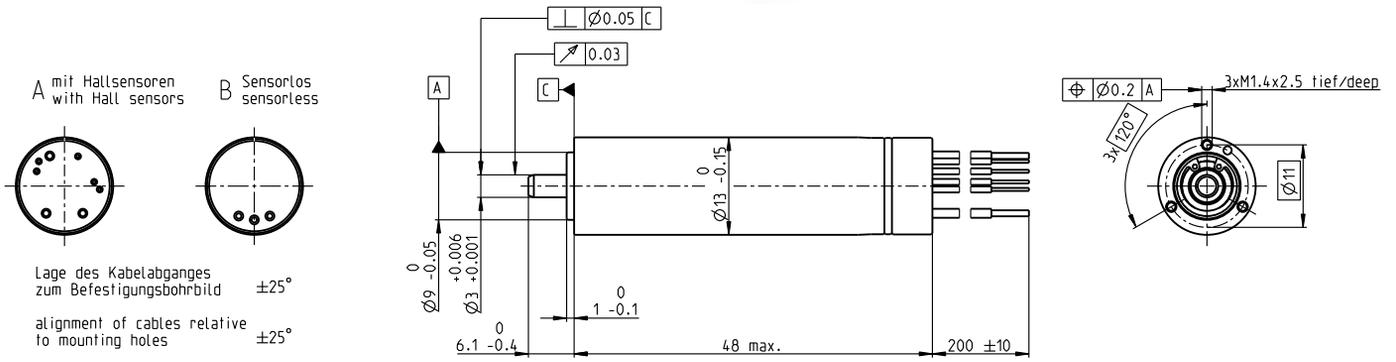
ECX SPEED 13 L brushless
BLDC motor ∅13 mm

Key Data: 25/27 W, 5.2 mNm, 50 000 rpm



M 1:1

	Motor Data					
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	42300	43100	42300	42700
3_	No load current	mA	165	128	82.5	62.8
4_	Nominal speed	rpm	38000	39100	38400	38700
5_	Nominal torque (max. continuous torque)	mNm	4.84	5.1	5.23	5.13
6_	Nominal current (max. continuous current)	A	1.35	1.08	0.724	0.539
7_	Stall torque	mNm	50.9	58.5	59.9	58.9
8_	Stall current	A	12.7	11.1	7.47	5.55
9_	Max. efficiency	%	79.1	80.3	80.6	80.4
10_	Terminal resistance	Ω	1.42	2.16	4.82	8.64
11_	Terminal inductance	mH	0.0444	0.0761	0.178	0.31
12_	Torque constant	mNm/A	4.01	5.25	8.02	10.6
13_	Speed constant	rpm/V	2380	1820	1190	901
14_	Speed/torque gradient	rpm/mNm	842	746	715	734
15_	Mechanical time constant	ms	3.3	2.92	2.8	2.88
16_	Rotor inertia	gcm²	0.374	0.374	0.374	0.374

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	23.7
18_	Thermal resistance winding-housing	K/W	2
19_	Thermal time constant winding	s	2.12
20_	Thermal time constant motor	s	398
21_	Ambient temperature	°C	-20...+100
22_	Max. winding temperature	°C	155
	Mechanical data ball bearings		
23_	Max. speed	rpm	50 000
24_	Axial play	mm	0...0.28
	Preload	N	1.5
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	1.5
27_	Max. force for press fits (static)	N	50
	(static, shaft supported)	N	1500
28_	Max. radial load [mm from flange]	N	6 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	33.6
32_	Typical noise level [rpm]	dBA	47 [50 000]

Connection A and B, motor (Cable AWG A: 26, B: 22)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

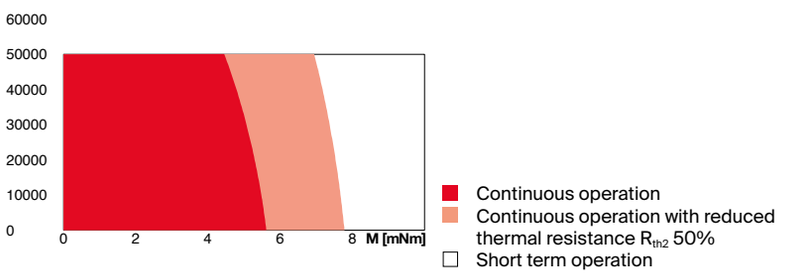
Connection A, sensors (Cable AWG 28)

orange	V_{CC} 5 ±0.5 V
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Output signals: CMOS compatible push-pull stage. No pull-up resistor required. Hall signals are generated by an EASY INT sensor. In combination with the ENX EASY INT, the orange (V_{CC}) and blue (GND) connections are not used.

Operating Range

n [rpm] winding 36 V



maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
327_GPX 13 SPEED	1–3	for motor type A:	486_ESCON Module 24/2
328_GPX 14 A/C	1–2 [3–4]	435_ENX 13 EASY INT	487_ESCON 36/3 EC
329_GPX 14 LN/LZ	1–2 [3–4]	for motor type B:	487_ESCON Module 50/4 EC-S
330_GPX 14 HP	2–3 [4]	435_ENX 13 EASY INT Abs.	487_ESCON Module 50/5
331_GPX 16 A/C	3–4		489_ESCON 50/5
332_GPX 16 LN/LZ	3–4		491_DEC Module 50/5
333_GPX 16 HP	4		495_EPOS4 Micro 24/5
			496_EPOS4 Mod./Comp. 24/1.5
			496_EPOS4 Mod./Comp. 50/5
			497_EPOS4 Comp. 24/5 3-axes
			501_EPOS4 50/5
			504_EPOS2 P 24/5

Configuration

Flange front: thread holes/center thread
Flange back: metal ring/external thread
Shaft front: length/diameter
Electric connection: cable length/pin connection/connector
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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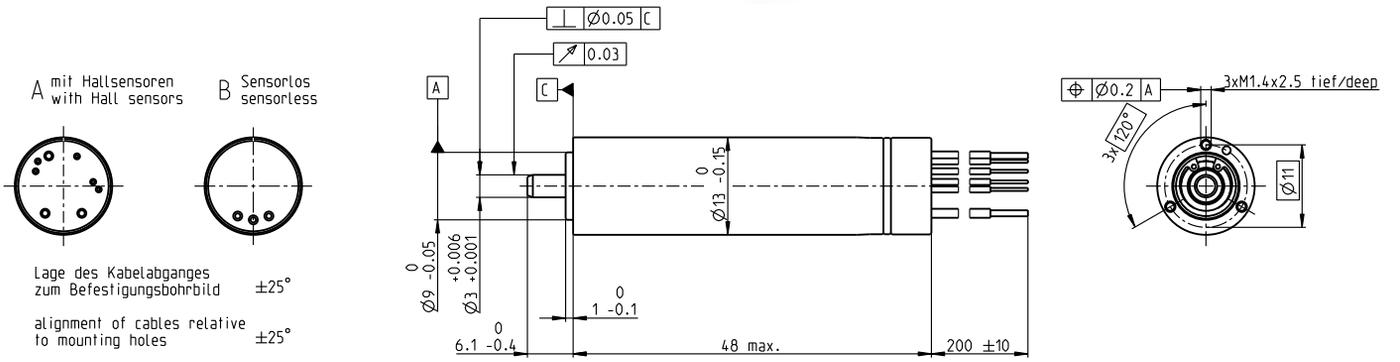
ECX SPEED 13 L brushless
BLDC motor ∅13 mm

High Power

Key Data: 50/54 W, 7.1 mNm, 70 000 rpm



M 1:1

	Motor Data					
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	67900	66400	67900	62300
3_	No load current	mA	223	161	112	72.1
4_	Nominal speed	rpm	64400	63100	64600	59000
5_	Nominal torque (max. continuous torque)	mNm	6.89	7.15	6.88	7.12
6_	Nominal current (max. continuous current)	A	2.93	2.22	1.46	1.03
7_	Stall torque	mNm	149	161	161	151
8_	Stall current	A	59.1	46.8	31.9	20.5
9_	Max. efficiency	%	88.3	88.8	88.7	88.7
10_	Terminal resistance	Ω	0.304	0.512	1.13	2.34
11_	Terminal inductance	mH	0.012	0.0223	0.0479	0.101
12_	Torque constant	mNm/A	2.52	3.44	5.04	7.33
13_	Speed constant	rpm/V	3790	2780	1890	1300
14_	Speed/torque gradient	rpm/mNm	457	414	424	415
15_	Mechanical time constant	ms	1.67	1.51	1.55	1.52
16_	Rotor inertia	gcm²	0.349	0.349	0.349	0.349

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	24.4
18_	Thermal resistance winding-housing	K/W	1.6
19_	Thermal time constant winding	s	1.68
20_	Thermal time constant motor	s	411
21_	Ambient temperature	°C	-20...+100
22_	Max. winding temperature	°C	155

	Mechanical data ball bearings		
23_	Max. speed	rpm	70 000
24_	Axial play	mm	0...0.28
	Preload	N	1.5
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	1.5
27_	Max. force for press fits (static)	N	50
	(static, shaft supported)	N	1500
28_	Max. radial load [mm from flange]	N	6 [5]

	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	33.7
32_	Typical noise level [rpm]	dBA	47 [50 000]

Connection A and B, motor (Cable AWG A: 26, B: 22)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

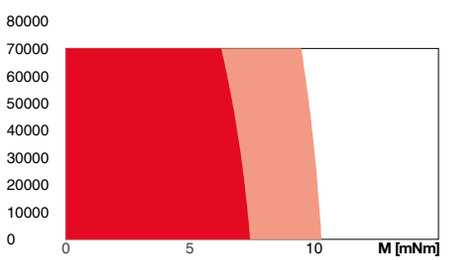
Connection A, sensors (Cable AWG 28)

orange	V_{CC} 5 ±0.5 V
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Output signals: CMOS compatible push-pull stage. No pull-up resistor required. Hall signals are generated by an EASY INT sensor. In combination with the ENX EASY INT, the orange (V_{CC}) and blue (GND) connections are not used.

Operating Range

n [rpm] winding 36 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Short term operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
327_GPX 13 SPEED	1–3	for motor type A:	487_ESCON 36/3 EC
328_GPX 14 A/C	1–2 [3–4]	435_ENX 13 EASY INT	487_ESCON Module 50/4 EC-S
329_GPX 14 LN/LZ	1–2 [3–4]	for motor type B:	487_ESCON Module 50/5
330_GPX 14 HP	2–3 [4]	435_ENX 13 EASY INT Abs.	489_ESCON 50/5
331_GPX 16 A/C	3–4		491_DEC Module 50/5
332_GPX 16 LN/LZ	3–4		495_EPOS4 Micro 24/5
333_GPX 16 HP	4		496_EPOS4 Mod./Comp. 50/5
			497_EPOS4 Comp. 24/5 3-axes
			501_EPOS4 50/5
			504_EPOS2 P 24/5

Configuration

Flange front: thread holes/center thread
Flange back: metal ring/external thread
Shaft front: length/diameter
Electric connection: cable length/pin connection/connector
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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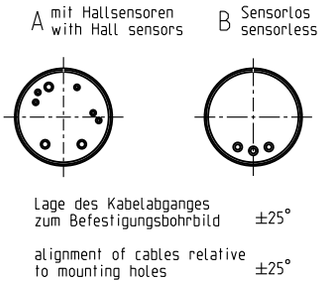
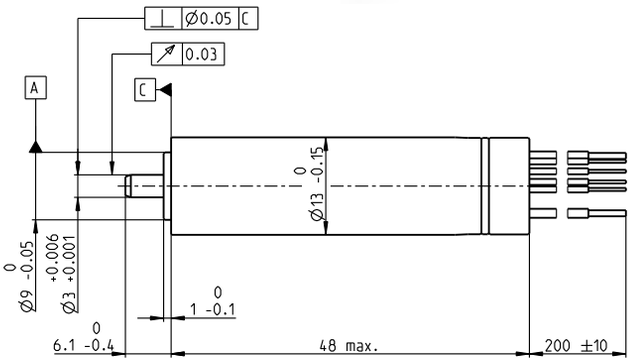
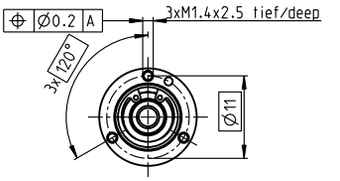
ECX SPEED 13 L brushless
BLDC motor ∅13 mm

Sterilizable

Key Data: 50/62 W, 7.8 mNm, 90 000 rpm







M 1:1

	Motor Data					
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	72200	70600	72200	66200
3_	No load current	mA	234	170	117	76.5
4_	Nominal speed	rpm	67500	66400	68200	62300
5_	Nominal torque (max. continuous torque)	mNm	7.55	7.8	7.53	7.69
6_	Nominal current (max. continuous current)	A	3.39	2.57	1.69	1.18
7_	Stall torque	mNm	124	140	146	139
8_	Stall current	A	52.3	43.4	30.8	20.2
9_	Max. efficiency	%	87.3	88.1	88.2	88.3
10_	Terminal resistance	Ω	0.344	0.552	1.17	2.38
11_	Terminal inductance	mH	0.00741	0.0138	0.0296	0.0627
12_	Torque constant	mNm/A	2.37	3.23	4.74	6.89
13_	Speed constant	rpm/V	4030	2950	2010	1390
14_	Speed/torque gradient	rpm/mNm	586	505	496	478
15_	Mechanical time constant	ms	1.93	1.67	1.64	1.58
16_	Rotor inertia	gcm²	0.315	0.315	0.315	0.315

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	22
18_	Thermal resistance winding-housing	K/W	2.04
19_	Thermal time constant winding	s	2.13
20_	Thermal time constant motor	s	448
21_	Ambient temperature	°C	-40...+135
22_	Max. winding temperature	°C	155
	Mechanical data ball bearings		
23_	Max. speed	rpm	90 000
24_	Axial play	mm	0...0.28
	Preload	N	1.5
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	1.5
27_	Max. force for press fits (static)	N	50
	(static, shaft supported)	N	1500
28_	Max. radial load [mm from flange]	N	6 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	41
32_	Typical noise level [rpm]	dBA	47 [50 000]

Connection A and B, motor (Cable AWG A: 26, B: 22)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

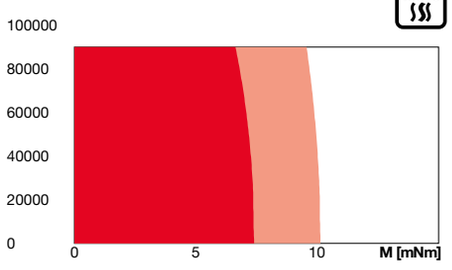
Connection A, sensors (Cable AWG 28)

orange	V_{CC} 5 ±0.5 V
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Output signals: CMOS compatible push-pull stage. No pull-up resistor required. Hall signals are generated by an EASY INT sensor. In combination with the ENX EASY INT, the orange (V_{CC}) and blue (GND) connections are not used.

Operating Range

n [rpm] winding 36 V



Sterilization information

Sterilization cycles
Sensorless: typical 2000
Hall sensors: typical 1000

Sterilization with steam

Temperature	+134°C ±4°C
Compression pressure up to	2.3 bar
Rel. humidity	100%
Cycle length	18 min.

- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Short term operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
327_GPX 13 SPEED	1–3	for motor type A: 435_ENX 13 EASY INT for motor type B: 435_ENX 13 EASY INT Abs.	487_ESCON 36/3 EC 487_ESCON Module 50/4 EC-S 487_ESCON Module 50/5 489_ESCON 50/5 491_DEC Module 50/5 495_EPOS4 Micro 24/5 496_EPOS4 Mod./Comp. 50/5 497_EPOS4 Comp. 24/5 3-axes 501_EPOS4 50/5 504_EPOS2 P 24/5

Configuration

Flange front: thread holes/center thread
Flange back: metal ring/external thread
Shaft front: length/diameter
Electric connection: cable length/pin connection
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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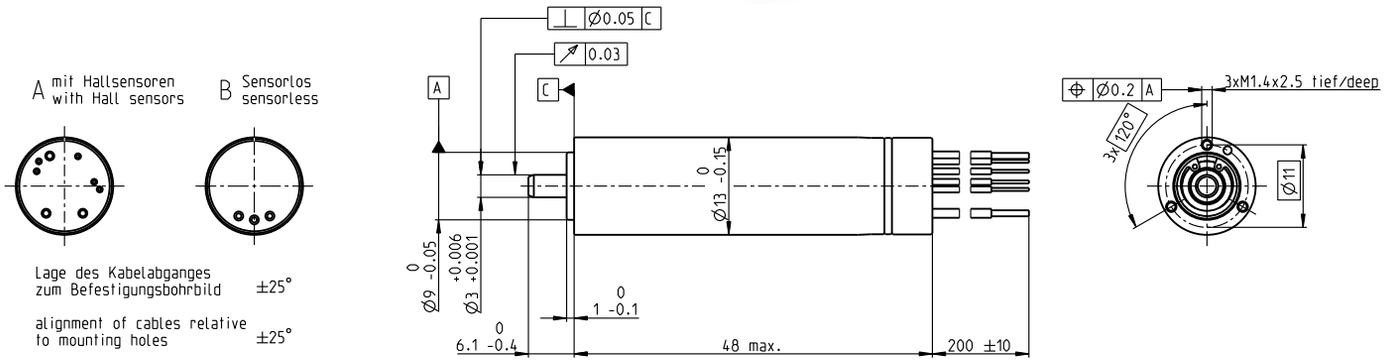
ECX SPEED 13 L brushless
BLDC motor ∅13 mm

Sterilizable, Ceramic Bearings

Key Data: 50/79 W, 7.9 mNm, 120 000 rpm



M 1:1

	Motor Data					
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	72200	70700	72300	66200
3_	No load current	mA	203	147	101	66
4_	Nominal speed	rpm	67500	66400	68200	62300
5_	Nominal torque (max. continuous torque)	mNm	7.65	7.91	7.64	7.78
6_	Nominal current (max. continuous current)	A	3.41	2.58	1.7	1.19
7_	Stall torque	mNm	124	140	146	139
8_	Stall current	A	52.3	43.4	30.8	20.2
9_	Max. efficiency	%	88.1	88.9	89	89.1
10_	Terminal resistance	Ω	0.344	0.552	1.17	2.38
11_	Terminal inductance	mH	0.00741	0.0138	0.0296	0.0627
12_	Torque constant	mNm/A	2.37	3.23	4.74	6.89
13_	Speed constant	rpm/V	4030	2950	2010	1390
14_	Speed/torque gradient	rpm/mNm	586	505	496	478
15_	Mechanical time constant	ms	1.93	1.67	1.64	1.58
16_	Rotor inertia	gcm²	0.315	0.315	0.315	0.315

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	22
18_	Thermal resistance winding-housing	K/W	2.0
19_	Thermal time constant winding	s	2.13
20_	Thermal time constant motor	s	448
21_	Ambient temperature	°C	-40...+135
22_	Max. winding temperature	°C	155
	Mechanical data ball bearings		
23_	Max. speed	rpm	120 000
24_	Axial play	mm	0...0.28
	Preload	N	1.5
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	1.5
27_	Max. force for press fits (static)	N	50
	(static, shaft supported)	N	1500
28_	Max. radial load [mm from flange]	N	6 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	41
32_	Typical noise level [rpm]	dBA	47 [50 000]

Connection A and B, motor (Cable AWG A: 26, B: 22)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

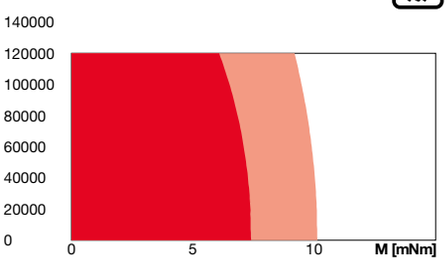
Connection A, sensors (Cable AWG 28)

orange	V_{CC} 5 ±0.5 V
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Output signals: CMOS compatible push-pull stage. No pull-up resistor required. Hall signals are generated by an EASY INT sensor. In combination with the ENX EASY INT, the orange (V_{CC}) and blue (GND) connections are not used.

Operating Range

n [rpm] winding 36 V



Sterilization information

135°C SSS

Sterilization cycles
Sensorless: typical 2000
Hall sensors: typical 1000

Sterilization with steam

Temperature	+134°C ±4°C
Compression pressure up to	2.3 bar
Rel. humidity	100%
Cycle length	18 min.

- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Short term operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
327_GPX 13 SPEED	1–3	for motor type A: 435_ENX 13 EASY INT for motor type B: 435_ENX 13 EASY INT Abs.	487_ESCON 36/3 EC 487_ESCON Module 50/4 EC-S 487_ESCON Module 50/5 489_ESCON 50/5 491_DEC Module 50/5 495_EPOS4 Micro 24/5 496_EPOS4 Mod./Comp. 50/5 497_EPOS4 Comp. 24/5 3-axes 501_EPOS4 50/5 504_EPOS2 P 24/5

Configuration

Flange front: thread holes/center thread
Flange back: metal ring/external thread
Shaft front: length/diameter
Electric connection: cable length/pin connection
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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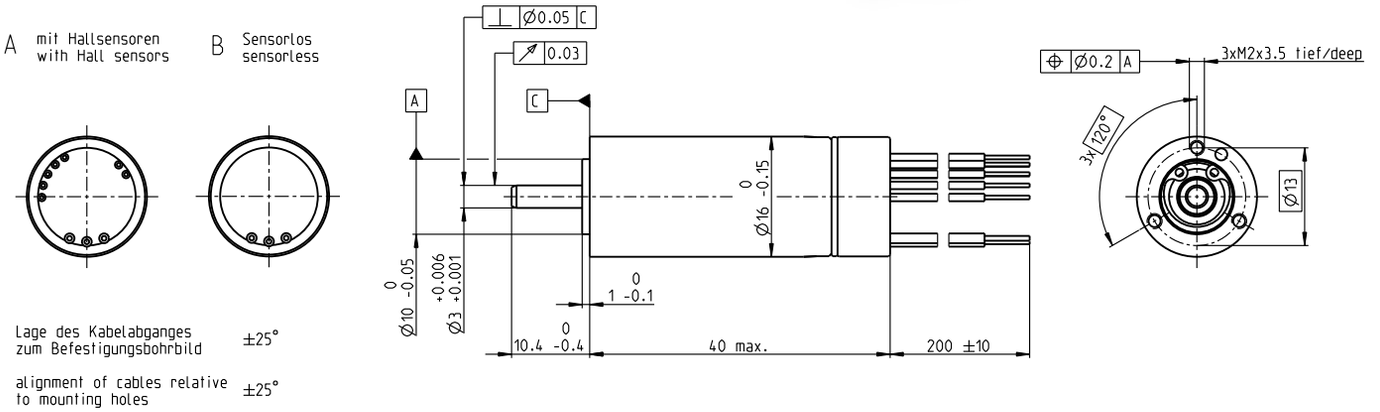
ECX SPEED 16 M brushless
BLDC motor ∅16 mm

Key Data: 20/26 W, 5.1 mNm, 55 000 rpm



M 1:1

	Motor Data					
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	49600	49600	49700	49600
3_	No load current	mA	236	177	118	88.7
4_	Nominal speed	rpm	45100	45300	45500	45200
5_	Nominal torque (max. continuous torque)	mNm	4.69	4.93	5.1	4.75
6_	Nominal current (max. continuous current)	A	1.59	1.24	0.852	0.601
7_	Stall torque	mNm	57.3	63.2	67.8	59.9
8_	Stall current	A	16.8	13.9	9.94	6.59
9_	Max. efficiency	%	78.1	79.1	79.8	78.6
10_	Terminal resistance	Ω	1.07	1.73	3.62	7.29
11_	Terminal inductance	mH	0.0502	0.0893	0.201	0.357
12_	Torque constant	mNm/A	3.41	4.55	6.83	9.1
13_	Speed constant	rpm/V	2800	2100	1400	1050
14_	Speed/torque gradient	rpm/mNm	880	797	743	840
15_	Mechanical time constant	ms	7.42	6.73	6.27	7.09
16_	Rotor inertia	gcm²	0.806	0.806	0.806	0.806

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	20.3
18_	Thermal resistance winding-housing	K/W	1.52
19_	Thermal time constant winding	s	1.83
20_	Thermal time constant motor	s	508
21_	Ambient temperature	°C	-20...+100
22_	Max. winding temperature	°C	125

	Mechanical data ball bearings		
23_	Max. speed	rpm	55 000
24_	Axial play	mm	0...0.29
	Preload	N	1.5
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	1.5
27_	Max. force for press fits (static)	N	60
	(static, shaft supported)	N	2500
28_	Max. radial load [mm from flange]	N	10 [5]

	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	50
32_	Typical noise level [rpm]	dBA	50 [50 000]

Connection A and B, motor (Cable AWG 22)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors (Cable AWG 26)

orange	V_{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 47. In combination with the ENX EASY INT, the orange (V_{cc}) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

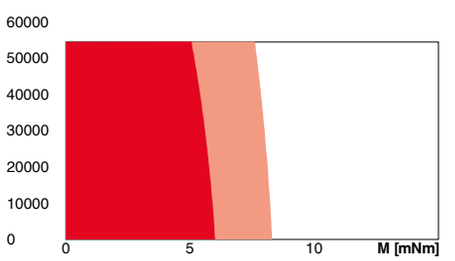
Connection NTC (Cable AWG 26)

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm ±1%, beta (25–85°C): 3490 K

Operating Range

n [rpm] winding 36 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Short term operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]
331_GPX 16 A/C	1–2 [3–4]
332_GPX 16 LN/LZ	1–2 [3–4]
333_GPX 16 HP	2–3 [4]
334_GPX 16 SPEED	1–2
335_GPX 19 A/C	3–4
336_GPX 19 LN/LZ	3–4
337_GPX 19 HP	4
338_GPX 19 SPEED	[3]

maxon sensor
for motor type A:
440_ENX 16 EASY INT
for motor type B:
440_ENX 16 EASY INT Abs.

maxon motor control
486_ESCON Module 24/2
487_ESCON 36/3 EC
487_ESCON Module 50/4 EC-S
487_ESCON Module 50/5
489_ESCON 50/5
491_DEC Module 24/2
491_DEC Module 50/5
495_EPOS4 Micro 24/5
496_EPOS4 Mod./Comp. 50/5
497_EPOS4 Comp. 24/5 3-axes
498_EPOS4 Mod./Comp. 24/1.5
501_EPOS4 50/5
504_EPOS2 P 24/5

Configuration

Flange front: thread holes/center thread
Flange back: plastic ring/external thread/with opening
Shaft front: length/diameter
Shaft rear: length
Electric connection: cable length/pin connection/connector
Temperature Sensor: NTC-Thermistor
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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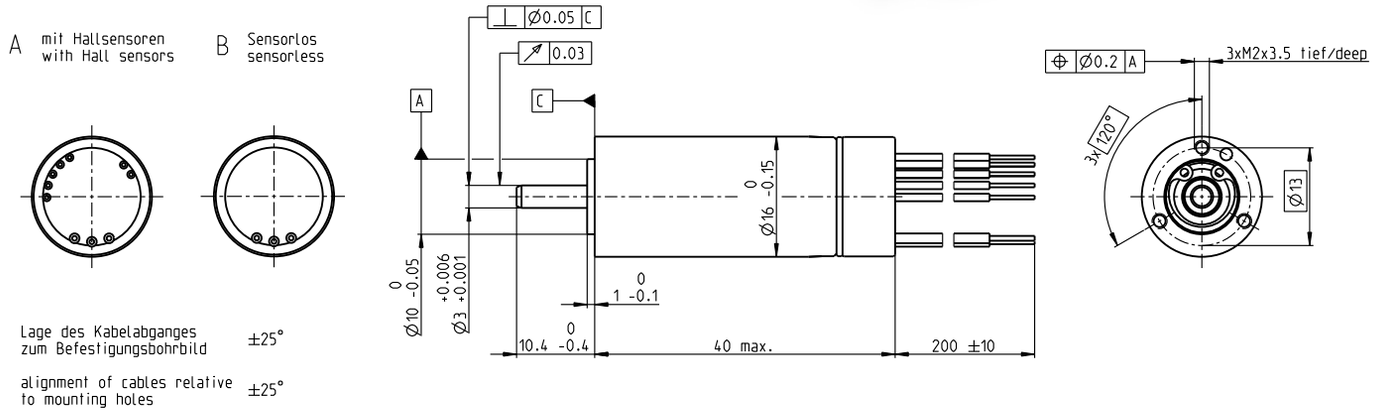
ECX SPEED 16 M brushless
BLDC motor ∅16 mm
High Power

Key Data: 40/50 W, 7.5 mNm, 70 000 rpm



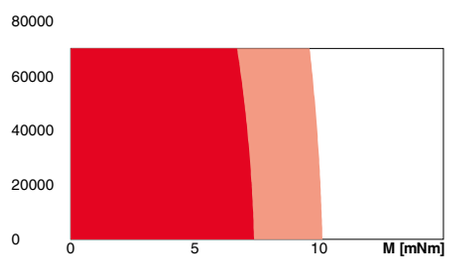
M 1:1

	Motor Data					
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	55100	58300	56400	56400
3_	No load current	mA	276	227	143	107
4_	Nominal speed	rpm	50800	54000	52200	52200
5_	Nominal torque (max. continuous torque)	mNm	7.53	7.21	7.4	7.44
6_	Nominal current (max. continuous current)	A	2.67	2.05	1.35	1.01
7_	Stall torque	mNm	109	111	113	115
8_	Stall current	A	35.1	28.5	18.8	14.3
9_	Max. efficiency	%	83.5	83.4	83.7	83.8
10_	Terminal resistance	Ω	0.512	0.841	1.92	3.35
11_	Terminal inductance	mH	0.0295	0.0469	0.113	0.201
12_	Torque constant	mNm/A	3.09	3.9	6.04	8.06
13_	Speed constant	rpm/V	3090	2450	1580	1180
14_	Speed/torque gradient	rpm/mNm	513	529	501	493
15_	Mechanical time constant	ms	4.36	4.5	4.26	4.19
16_	Rotor inertia	gcm²	0.812	0.812	0.812	0.812

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	20.3
18_	Thermal resistance winding-housing	K/W	1.8
19_	Thermal time constant winding	s	2.16
20_	Thermal time constant motor	s	508
21_	Ambient temperature	°C	-20...+100
22_	Max. winding temperature	°C	155
	Mechanical data ball bearings		
23_	Max. speed	rpm	70 000
24_	Axial play	mm	0...0.29
	Preload	N	1.5
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	1.5
27_	Max. force for press fits (static)	N	60
	(static, shaft supported)	N	2500
28_	Max. radial load [mm from flange]	N	10 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	50
32_	Typical noise level [rpm]	dBA	50 [50 000]

Operating Range

n [rpm] winding 36 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Short term operation

Connection A and B, motor (Cable AWG 22)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors (Cable AWG 26)

orange	V_{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 47. In combination with the ENX EASY INT, the orange (V_{cc}) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

Connection NTC (Cable AWG 26)

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm ±1%, beta (25–85°C): 3490 K

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
331_GPX 16 A/C	1–2 [3–4]	for motor type A:	486_ESCON Module 24/2
332_GPX 16 LN/LZ	1–2 [3–4]	440_ENX 16 EASY INT	487_ESCON 36/3 EC
333_GPX 16 HP	2–3 [4]	for motor type B:	487_ESCON Module 50/4 EC-S
334_GPX 16 SPEED	1–2	440_ENX 16 EASY INT Abs.	487_ESCON Module 50/5
335_GPX 19 A/C	3–4		489_ESCON 50/5
336_GPX 19 LN/LZ	3–4		491_DEC Module 24/2
337_GPX 19 HP	4		491_DEC Module 50/5
338_GPX 19 SPEED	[3]		495_EPOS4 Micro 24/5
			496_EPOS4 Mod./Comp. 50/5
			497_EPOS4 Comp. 24/5 3-axes
			501_EPOS4 50/5
			504_EPOS2 P 24/5

Configuration

Flange front: thread holes/center thread
Flange back: plastic ring/external thread/with opening
Shaft front: length/diameter
Shaft rear: length
Electric connection: cable length/pin connection/connector
Temperature Sensor: NTC-Thermistor
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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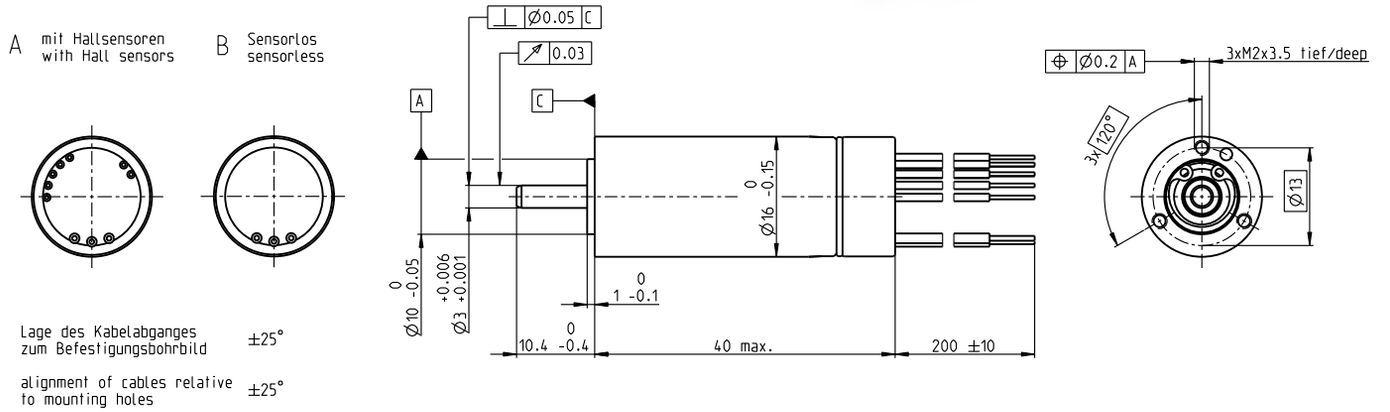
ECX SPEED 16 M brushless
BLDC motor ∅16 mm

Sterilizable

Key Data: 40/50 W, 6.8 mNm, 70 000 rpm



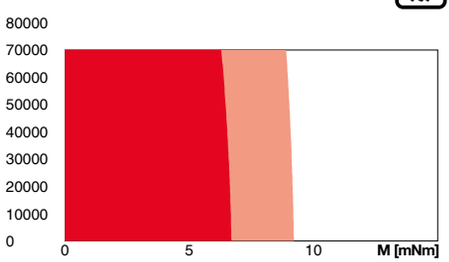
M 1:1

	Motor Data					
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	61500	65000	57700	58900
3_	No load current	mA	275	227	124	96.2
4_	Nominal speed	rpm	56400	60000	52700	53900
5_	Nominal torque (max. continuous torque)	mNm	6.84	6.56	6.56	6.6
6_	Nominal current (max. continuous current)	A	2.69	2.07	1.21	0.935
7_	Stall torque	mNm	97.3	99.6	87.2	91
8_	Stall current	A	35.1	28.5	14.8	11.8
9_	Max. efficiency	%	83.5	83.4	83	83.2
10_	Terminal resistance	Ω	0.512	0.841	2.43	4.06
11_	Terminal inductance	mH	0.0341	0.0542	0.155	0.264
12_	Torque constant	mNm/A	2.77	3.49	5.9	7.7
13_	Speed constant	rpm/V	3450	2740	1620	1240
14_	Speed/torque gradient	rpm/mNm	638	659	668	654
15_	Mechanical time constant	ms	3.94	4.06	4.12	4.03
16_	Rotor inertia	gcm²	0.589	0.589	0.589	0.589

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	20.3
18_	Thermal resistance winding-housing	K/W	1.8
19_	Thermal time constant winding	s	2.16
20_	Thermal time constant motor	s	508
21_	Ambient temperature	°C	-40...+135
22_	Max. winding temperature	°C	155
	Mechanical data ball bearings		
23_	Max. speed	rpm	70 000
24_	Axial play	mm	0..0.29
	Preload	N	1.5
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	1.5
27_	Max. force for press fits (static)	N	60
	(static, shaft supported)	N	2500
28_	Max. radial load [mm from flange]	N	10 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	50
32_	Typical noise level [rpm]	dBA	50 [50 000]

Operating Range

n [rpm] winding 36 V



135°C SS

Sterilization information

Sterilization cycles
Sensorless: typical 2000
Hall sensors: typical 1000

Sterilization with steam

Temperature	+134°C ±4°C
Compression pressure up to	2.3 bar
Rel. humidity	100%
Cycle length	18 min.

- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Short term operation

Connection A and B, motor (Cable AWG 22)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors (Cable AWG 26)

orange	V_{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 47. In combination with the ENX EASY INT, the orange (V_{cc}) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

Connection NTC (Cable AWG 26)

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm ±1%, beta (25–85°C): 3490 K

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor
334_GPX 16 SPEED	1–2	for motor type A:
338_GPX 19 SPEED	[3]	440_ENX 16 EASY INT
		for motor type B:
		440_ENX 16 EASY INT Abs.

maxon motor control

486_ESCON Module 24/2
487_ESCON 36/3 EC
487_ESCON Module 50/4 EC-S
487_ESCON Module 50/5
489_ESCON 50/5
491_DEC Module 50/5
491_DEC Module 24/2
495_EPOS4 Micro 24/5
496_EPOS4 Mod./Comp. 50/5
497_EPOS4 Comp. 24/5 3-axer
498_EPOS4 Mod./Comp. 24/1.5
501_EPOS4 50/5
504_EPOS2 P 24/5

Configuration

Flange front: thread holes/center thread
Flange back: plastic ring/external thread/with opening
Shaft front: length/diameter
Electric connection: cable length/pin connection
Temperature Sensor: NTC-Thermistor
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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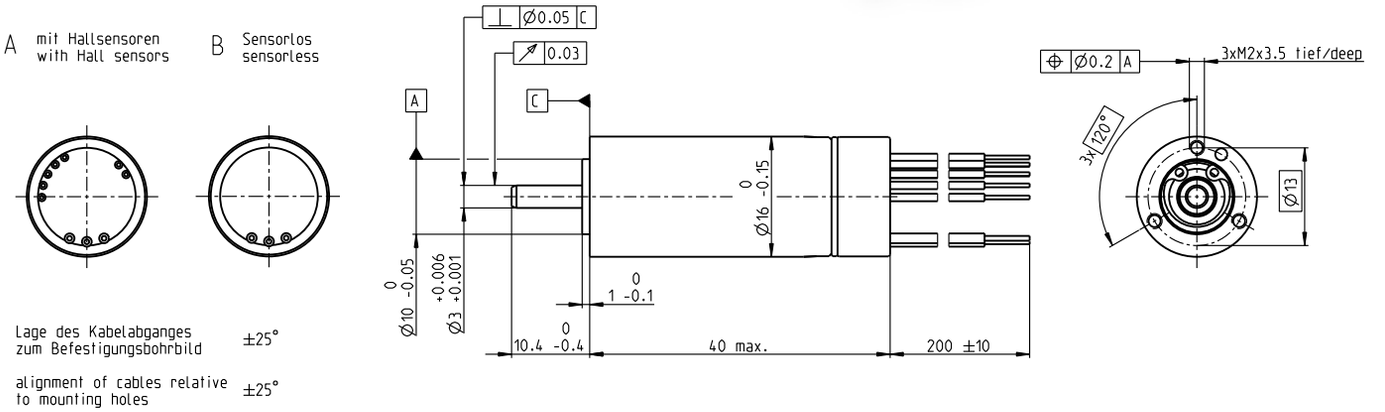
ECX SPEED 16 M brushless
BLDC motor ∅16 mm

Sterilizable, Ceramic Bearings

Key Data: 40/68 W, 6.6 mNm, 120 000 rpm



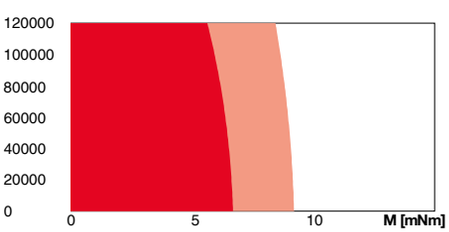
M 1:1

	Motor Data					
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	61400	64900	57600	58800
3_	No load current	mA	328	271	147	114
4_	Nominal speed	rpm	56500	60000	52700	54000
5_	Nominal torque (max. continuous torque)	mNm	6.63	6.34	6.38	6.41
6_	Nominal current (max. continuous current)	A	2.67	2.04	1.2	0.927
7_	Stall torque	mNm	97.3	99.6	87.2	91
8_	Stall current	A	35.1	28.5	14.8	11.8
9_	Max. efficiency	%	82.1	82	81.6	81.8
10_	Terminal resistance	Ω	0.512	0.841	2.43	4.06
11_	Terminal inductance	mH	0.0341	0.0542	0.155	0.264
12_	Torque constant	mNm/A	2.77	3.49	5.9	7.7
13_	Speed constant	rpm/V	3450	2740	1620	1240
14_	Speed/torque gradient	rpm/mNm	638	659	668	654
15_	Mechanical time constant	ms	3.94	4.06	4.12	4.03
16_	Rotor inertia	gcm²	0.589	0.589	0.589	0.589

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	20.3
18_	Thermal resistance winding-housing	K/W	1.8
19_	Thermal time constant winding	s	2.16
20_	Thermal time constant motor	s	508
21_	Ambient temperature	°C	-40...+135
22_	Max. winding temperature	°C	155
	Mechanical data ball bearings		
23_	Max. speed	rpm	120 000
24_	Axial play	mm	0..0.29
	Preload	N	1.5
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	1.5
27_	Max. force for press fits (static)	N	60
	(static, shaft supported)	N	2500
28_	Max. radial load [mm from flange]	N	10 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	50
32_	Typical noise level [rpm]	dBA	50 [50 000]

Operating Range

n [rpm] winding 36 V



135°C SS

Sterilization information

Sterilization cycles
Sensorless: typical 2000
Hall sensors: typical 1000

Sterilization with steam

Temperature	+134°C ±4°C
Compression pressure up to	2.3 bar
Rel. humidity	100%
Cycle length	18 min.

- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Short term operation

Connection A and B, motor (Cable AWG 22)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors (Cable AWG 26)

orange	V_{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 47. In combination with the ENX EASY INT, the orange (V_{cc}) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

Connection NTC (Cable AWG 26)

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm ±1%, beta (25–85°C): 3490 K

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
334_GPX 16 SPEED	1–2	for motor type A:	486_ESCON Module 24/2
338_GPX 19 SPEED	[3]	440_ENX 16 EASY INT	487_ESCON 36/3 EC
		for motor type B:	487_ESCON Module 50/4 EC-S
		440_ENX 16 EASY INT Abs.	487_ESCON Module 50/5
			489_ESCON 50/5
			491_DEC Module 24/2
			491_DEC Module 50/5
			495_EPOS4 Micro 24/5
			496_EPOS4 Mod./Comp. 50/5
			497_EPOS4 Comp. 24/5 3-axes
			501_EPOS4 50/5
			504_EPOS2 P 24/5

Configuration

Flange front: thread holes/center thread
Flange back: plastic ring/external thread/with opening
Shaft front: length/diameter
Electric connection: cable length/pin connection
Temperature Sensor: NTC-Thermistor
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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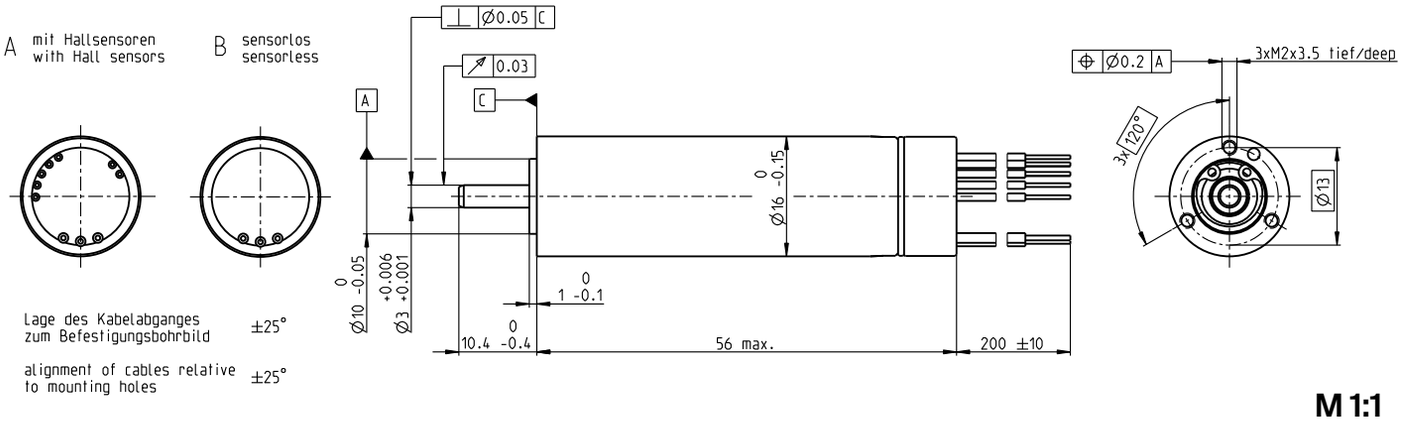
ECX SPEED 16 L brushless
BLDC motor ∅16 mm

Key Data: 40/52 W, 10.6 mNm, 50 000 rpm



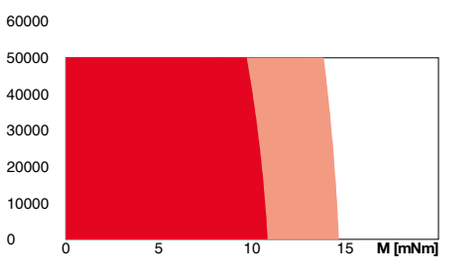
M 1:1

	Motor Data					
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	47500	47500	48400	48800
3_	No load current	mA	342	256	176	134
4_	Nominal speed	rpm	43900	44100	45100	45600
5_	Nominal torque (max. continuous torque)	mNm	9.73	9.84	10.3	10.6
6_	Nominal current (max. continuous current)	A	3.02	2.29	1.61	1.25
7_	Stall torque	mNm	142	150	170	182
8_	Stall current	A	39.8	31.4	24.1	19.6
9_	Max. efficiency	%	82.7	83.1	84	84.5
10_	Terminal resistance	Ω	0.453	0.765	1.49	2.45
11_	Terminal inductance	mH	0.0221	0.0392	0.0853	0.149
12_	Torque constant	mNm/A	3.58	4.78	7.04	9.31
13_	Speed constant	rpm/V	2670	2000	1360	1030
14_	Speed/torque gradient	rpm/mNm	337	320	287	270
15_	Mechanical time constant	ms	3.52	3.34	3	2.82
16_	Rotor inertia	gcm²	0.997	0.997	0.997	0.997

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	16.2
18_	Thermal resistance winding-housing	K/W	2.34
19_	Thermal time constant winding	s	4.91
20_	Thermal time constant motor	s	588
21_	Ambient temperature	°C	-20...+100
22_	Max. winding temperature	°C	155
	Mechanical data ball bearings		
23_	Max. speed	rpm	50 000
24_	Axial play	mm	0...0.29
	Preload	N	1.5
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	1.5
27_	Max. force for press fits (static)	N	60
	(static, shaft supported)	N	2500
28_	Max. radial load [mm from flange]	N	10 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	72.6
32_	Typical noise level [rpm]	dBA	52 [50 000]

Operating Range

n [rpm] winding 36 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Short term operation

Connection A and B, motor (Cable AWG 22)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors (Cable AWG 26)

orange	V_{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 47. In combination with the ENX EASY INT, the orange (V_{cc}) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

Connection NTC (Cable AWG 26)

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm ±1%, beta (25–85°C): 3490 K

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
331_GPX 16 A/C	1–2 [3–4]	for motor type A:	487_ESCON 36/3 EC
332_GPX 16 LN/LZ	1–2 [3–4]	440_ENX 16 EASY INT	487_ESCON Module 50/4 EC-S
333_GPX 16 HP	2–3 [4]	for motor type B:	487_ESCON Module 50/5
334_GPX 16 SPEED	1–2	440_ENX 16 EASY INT Abs.	489_ESCON 50/5
335_GPX 19 A/C	3–4		491_DEC Module 50/5
336_GPX 19 LN/LZ	3–4		495_EPOS4 Micro 24/5
337_GPX 19 HP	4		496_EPOS4 Mod./Comp. 50/5
338_GPX 19 SPEED	[3]		497_EPOS4 Comp. 24/5 3-axes
			501_EPOS4 50/5
			504_EPOS2 P 24/5

Configuration

Flange front: thread holes/center thread
Flange back: plastic ring/external thread/with opening
Shaft front: length/diameter
Shaft rear: length
Electric connection: cable length/pin connection/connector
Temperature Sensor: NTC-Thermistor
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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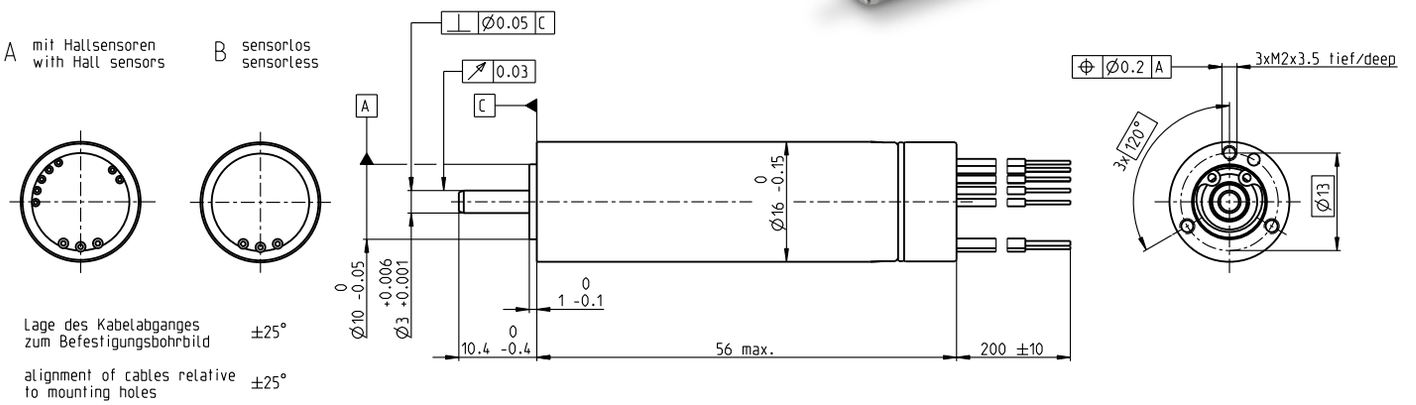
ECX SPEED 16 L brushless
BLDC motor ∅16 mm
High Power

Key Data: 80/107 W, 16 mNm, 70 000 rpm



M 1:1

	Motor Data					
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	64600	64600	64600	64600
3_	No load current	mA	459	344	230	172
4_	Nominal speed	rpm	61200	61600	61800	61800
5_	Nominal torque (max. continuous torque)	mNm	15.4	16	15.4	14.7
6_	Nominal current (max. continuous current)	A	6.2	4.82	3.1	2.24
7_	Stall torque	mNm	346	407	414	396
8_	Stall current	A	131	115	78.1	56
9_	Max. efficiency	%	88.7	89.5	89.6	89.4
10_	Terminal resistance	Ω	0.138	0.208	0.461	0.858
11_	Terminal inductance	mH	0.00794	0.0141	0.0318	0.0565
12_	Torque constant	mNm/A	2.65	3.53	5.3	7.07
13_	Speed constant	rpm/V	3600	2700	1800	1350
14_	Speed/torque gradient	rpm/mNm	187	159	157	164
15_	Mechanical time constant	ms	2.35	2	1.97	2.06
16_	Rotor inertia	gcm²	1.2	1.2	1.2	1.2

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	16.2
18_	Thermal resistance winding-housing	K/W	0.58
19_	Thermal time constant winding	s	1.37
20_	Thermal time constant motor	s	588
21_	Ambient temperature	°C	-20...+100
22_	Max. winding temperature	°C	155

	Mechanical data ball bearings		
23_	Max. speed	rpm	70 000
24_	Axial play	mm	0...0.29
	Preload	N	1.5
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	1.5
27_	Max. force for press fits (static)	N	60
	(static, shaft supported)	N	2500
28_	Max. radial load [mm from flange]	N	10 [5]

	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	72.6
32_	Typical noise level [rpm]	dBA	52 [50 000]

Connection A and B, motor (Cable AWG 22)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors (Cable AWG 26)

orange	V_{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 47. In combination with the ENX EASY INT, the orange (V_{cc}) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

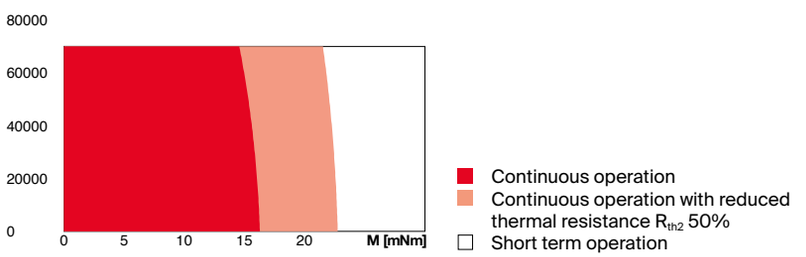
Connection NTC (Cable AWG 26)

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm ±1%, beta (25–85°C): 3490 K

Operating Range

n [rpm] winding 36 V



maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]
331_GPX 16 A/C	1–2 [3–4]
332_GPX 16 LN/LZ	1–2 [3–4]
333_GPX 16 HP	2–3 [4]
334_GPX 16 SPEED	1–2
335_GPX 19 A/C	3–4
336_GPX 19 LN/LZ	3–4
337_GPX 19 HP	4
338_GPX 19 SPEED	[3]

maxon sensor
for motor type A:
440_ENX 16 EASY INT
for motor type B:
440_ENX 16 EASY INT Abs.

maxon motor control
487_ESCON 36/3 EC
487_ESCON Module 50/4 EC-S
487_ESCON Module 50/5
487_ESCON 50/5
488_ESCON Module 50/8 HE
489_ESCON 70/10
491_DEC Module 50/5
495_EPOS4 Micro 24/5
496_EPOS4 Mod./Comp. 50/5
497_EPOS4 Comp. 24/5 3-axes
497_EPOS4 Mod./Comp. 50/8
501_EPOS4 50/5
501_EPOS4 70/15
504_EPOS2 P 24/5

Configuration

Flange front: thread holes/center thread
Flange back: plastic ring/external thread/with opening
Shaft front: length/diameter
Shaft rear: length
Electric connection: cable length/pin connection/connector
Temperature Sensor: NTC-Thermistor
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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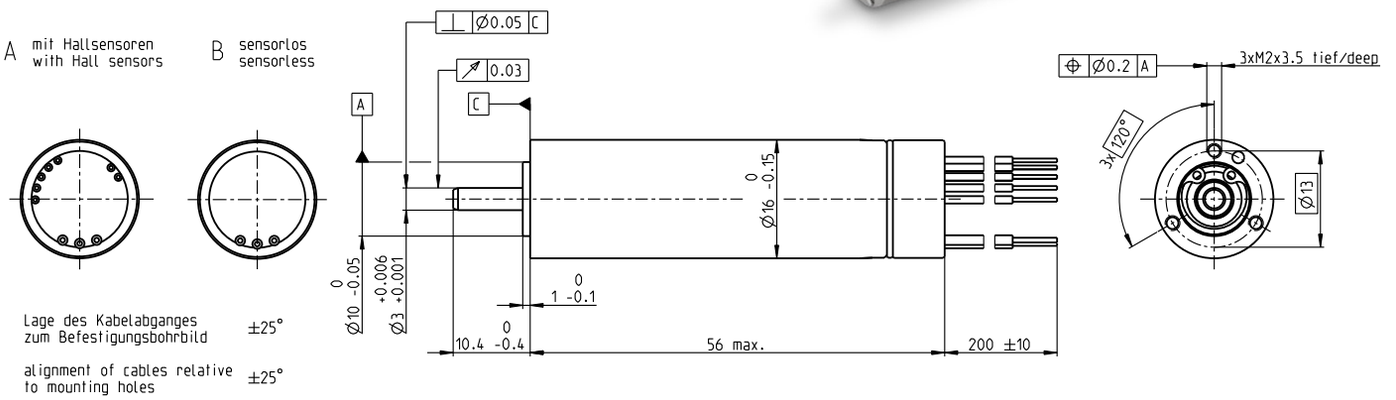
ECX SPEED 16 L brushless
BLDC motor ∅16 mm

Sterilizable

Key Data: 80/108 W, 16.3 mNm, 70 000 rpm



M 1:1

	Motor Data					
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	65700	65800	65800	65800
3_	No load current	mA	333	250	167	125
4_	Nominal speed	rpm	62100	62400	62600	62600
5_	Nominal torque (max. continuous torque)	mNm	15.7	16.3	15.7	15
6_	Nominal current (max. continuous current)	A	6.28	4.87	3.13	2.26
7_	Stall torque	mNm	341	401	407	389
8_	Stall current	A	131	115	78.1	56
9_	Max. efficiency	%	90.3	91	91.1	90.9
10_	Terminal resistance	Ω	0.138	0.208	0.461	0.858
11_	Terminal inductance	mH	0.01	0.0178	0.04	0.0712
12_	Torque constant	mNm/A	2.61	3.48	5.21	6.95
13_	Speed constant	rpm/V	3660	2750	1830	1370
14_	Speed/torque gradient	rpm/mNm	194	165	162	170
15_	Mechanical time constant	ms	1.93	1.64	1.62	1.69
16_	Rotor inertia	gcm²	0.952	0.952	0.952	0.952

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	16.2
18_	Thermal resistance winding-housing	K/W	0.58
19_	Thermal time constant winding	s	1.28
20_	Thermal time constant motor	s	588
21_	Ambient temperature	°C	-40...+135
22_	Max. winding temperature	°C	155
	Mechanical data ball bearings		
23_	Max. speed	rpm	70 000
24_	Axial play	mm	0...0.29
	Preload	N	1.5
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	1.5
27_	Max. force for press fits (static)	N	60
	(static, shaft supported)	N	2500
28_	Max. radial load [mm from flange]	N	10 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	72.6
32_	Typical noise level [rpm]	dBA	52 [50 000]

Connection A and B, motor (Cable AWG 22)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors (Cable AWG 26)

orange	V_{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 47. In combination with the ENX EASY INT, the orange (V_{cc}) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

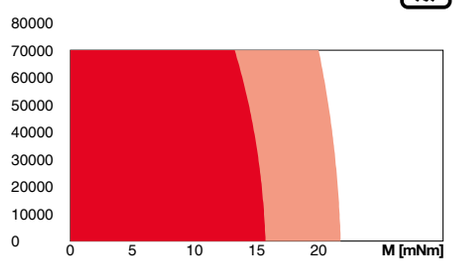
Connection NTC (Cable AWG 26)

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm ±1%, beta (25–85°C): 3490 K

Operating Range

n [rpm] winding 36 V



Sterilization information

135°C SS

Sterilization cycles
Sensorless: typical 2000
Hall sensors: typical 1000

Sterilization with steam

Temperature	+134°C ±4°C
Compression pressure up to	2.3 bar
Rel. humidity	100%
Cycle length	18 min.

- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Short term operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
334_GPX 16 SPEED	1–2	for motor type A:	487_ESCON 36/3 EC
338_GPX 19 SPEED	[3]	440_ENX 16 EASY INT	487_ESCON Module 50/4 EC-S
		for motor type B:	487_ESCON Module 50/5
		440_ENX 16 EASY INT Abs.	488_ESCON Module 50/8 HE
			489_ESCON 50/5
			489_ESCON 70/10
			491_DEC Module 50/5
			495_EPOS4 Micro 24/5
			496_EPOS4 Mod./Comp. 50/5
			497_EPOS4 Comp. 24/5 3-axes
			497_EPOS4 Mod./Comp. 50/8
			501_EPOS4 50/5
			501_EPOS4 70/15
			504_EPOS2 P 24/5

Configuration

Flange front: thread holes/center thread
Flange back: plastic ring/external thread/with opening
Shaft front: length/diameter
Electric connection: cable length/pin connection
Temperature Sensor: NTC-Thermistor
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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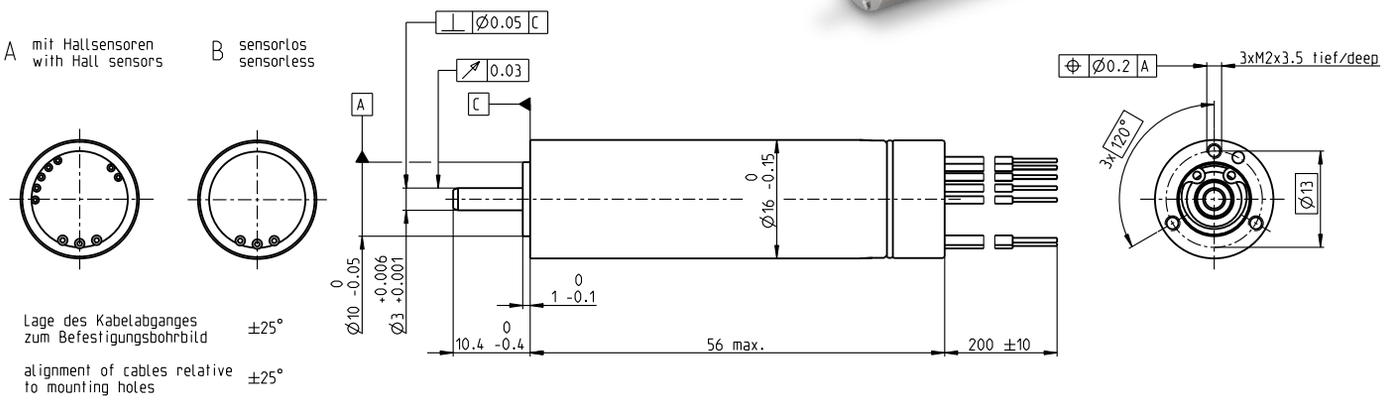
ECX SPEED 16 L brushless BLDC motor ∅16 mm

Sterilizable, Ceramic Bearings

Key Data: 80/132 W, 15.7 mNm, 120 000 rpm



M 1:1

	Motor Data					
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	65700	65700	65700	65700
3_	No load current	mA	383	287	192	144
4_	Nominal speed	rpm	62200	62500	62700	62700
5_	Nominal torque (max. continuous torque)	mNm	15.2	15.7	15.1	14.5
6_	Nominal current (max. continuous current)	A	6.12	4.75	3.05	2.2
7_	Stall torque	mNm	341	401	407	389
8_	Stall current	A	131	115	78.1	56
9_	Max. efficiency	%	89.7	90.4	90.5	90.3
10_	Terminal resistance	Ω	0.138	0.208	0.461	0.858
11_	Terminal inductance	mH	0.01	0.0178	0.04	0.0712
12_	Torque constant	mNm/A	2.61	3.48	5.21	6.95
13_	Speed constant	rpm/V	3660	2750	1830	1370
14_	Speed/torque gradient	rpm/mNm	194	165	162	170
15_	Mechanical time constant	ms	1.93	1.64	1.62	1.69
16_	Rotor inertia	gcm²	0.952	0.952	0.952	0.952

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	16.2
18_	Thermal resistance winding-housing	K/W	0.58
19_	Thermal time constant winding	s	1.14
20_	Thermal time constant motor	s	588
21_	Ambient temperature	°C	-40...+135
22_	Max. winding temperature	°C	155
	Mechanical data ball bearings		
23_	Max. speed	rpm	120 000
24_	Axial play	mm	0...0.29
	Preload	N	1.5
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	1.5
27_	Max. force for press fits (static)	N	60
	(static, shaft supported)	N	2500
28_	Max. radial load [mm from flange]	N	10 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	72.6
32_	Typical noise level [rpm]	dBA	52 [50 000]

Connection A and B, motor (Cable AWG 22)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors (Cable AWG 26)

orange	V_{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 47. In combination with the ENX EASY INT, the orange (V_{cc}) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

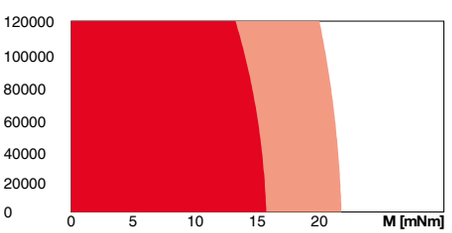
Connection NTC (Cable AWG 26)

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm ±1%, beta (25–85°C): 3490 K

Operating Range

n [rpm] winding 36 V



Sterilization information

135°C SS

Sterilization cycles
Sensorless: typical 2000
Hall sensors: typical 1000

Sterilization with steam

Temperature	+134°C ±4°C
Compression pressure up to	2.3 bar
Rel. humidity	100%
Cycle length	18 min.

- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Short term operation

maxon Modular System Details on catalog page 32

maxon gear Stages [opt.]
334_GPX 16 SPEED 1–2
338_GPX 19 SPEED [3]

maxon sensor
for motor type A:
440_ENX 16 EASY INT
for motor type B:
440_ENX 16 EASY INT Abs.

maxon motor control
487_ESCON 36/3 EC
487_ESCON Module 50/4 EC-S
487_ESCON Module 50/5
488_ESCON Module 50/8 HE
489_ESCON 50/5
489_ESCON 70/10
491_DEC Module 50/5
495_EPOS4 Micro 24/5
496_EPOS4 Mod./Comp. 50/5
497_EPOS4 Comp. 24/5 3-axes
497_EPOS4 Mod./Comp. 50/8
501_EPOS4 50/5
501_EPOS4 70/15
504_EPOS2 P 24/5

Configuration

Flange front: thread holes/center thread
Flange back: plastic ring/external thread/with opening
Shaft front: length/diameter
Electric connection: cable length/pin connection
Temperature Sensor: NTC-Thermistor
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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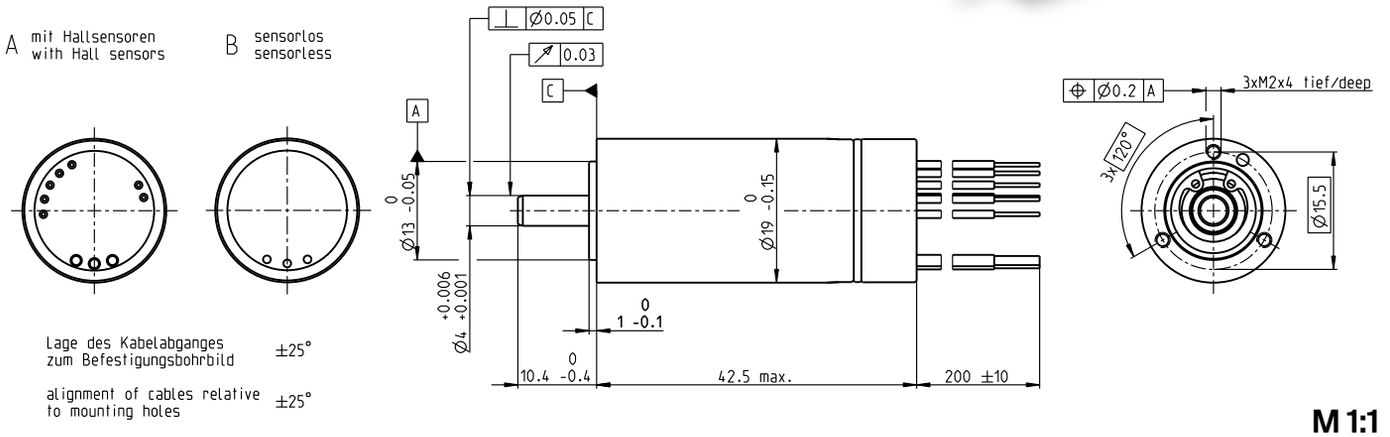
ECX SPEED 19 M brushless
BLDC motor ∅19 mm

Key Data: 30/37 W, 7.6 mNm, 50 000 rpm



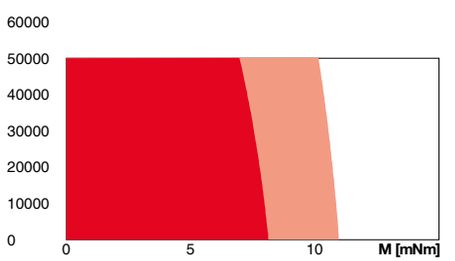
M 1:1

	Motor Data					
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	45200	47700	45200	47100
3_	No load current	mA	250	205	125	100
4_	Nominal speed	rpm	41000	43600	41100	42900
5_	Nominal torque (max. continuous torque)	mNm	7.61	7.47	7.57	7.08
6_	Nominal current (max. continuous current)	A	2.23	1.74	1.11	0.82
7_	Stall torque	mNm	94.8	101	96.7	91.8
8_	Stall current	A	25.2	21.3	12.8	9.54
9_	Max. efficiency	%	82	82	82	81
10_	Terminal resistance	Ω	0.715	1.13	2.8	5.03
11_	Terminal inductance	mH	0.0548	0.0873	0.219	0.358
12_	Torque constant	mNm/A	3.76	4.75	7.53	9.62
13_	Speed constant	rpm/V	2540	2010	1270	992
14_	Speed/torque gradient	rpm/mNm	482	476	473	519
15_	Mechanical time constant	ms	5.81	5.74	5.69	6.25
16_	Rotor inertia	gcm²	1.15	1.15	1.15	1.15

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	16.8
18_	Thermal resistance winding-housing	K/W	2.77
19_	Thermal time constant winding	s	5.55
20_	Thermal time constant motor	s	696
21_	Ambient temperature	°C	-20...+100
22_	Max. winding temperature	°C	155
	Mechanical data ball bearings		
23_	Max. speed	rpm	50 000
24_	Axial play	mm	0...0.29
	Preload	N	4
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	4
27_	Max. force for press fits (static)	N	70
	(static, shaft supported)	N	5000
28_	Max. radial load [mm from flange]	N	12 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	78
32_	Typical noise level [rpm]	dBA	48 [50 000]

Operating Range

n [rpm] winding 36 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Short term operation

Connection A and B, motor (Cable AWG 20)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors (Cable AWG 26)

orange	V_{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 47. In combination with the ENX EASY INT, the orange (V_{cc}) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

Connection NTC (Cable AWG 26)

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm ±1%, beta (25–85°C): 3490 K

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]
335_GPX 19 A/C	1–2 [3–4]
336_GPX 19 LN/LZ	1–2 [3–4]
337_GPX 19 HP	2–3 [4]
338_GPX 19 SPEED	1–2
339_GPX 22 A/C	3–4
340_GPX 22 LN/LZ	3–4
341_GPX 22 HP	4
343_GPX 22 SPEED	[3]

maxon sensor
for motor type A:
441_ENX 19 EASY INT
for motor type B:
441_ENX 19 EASY INT Abs.

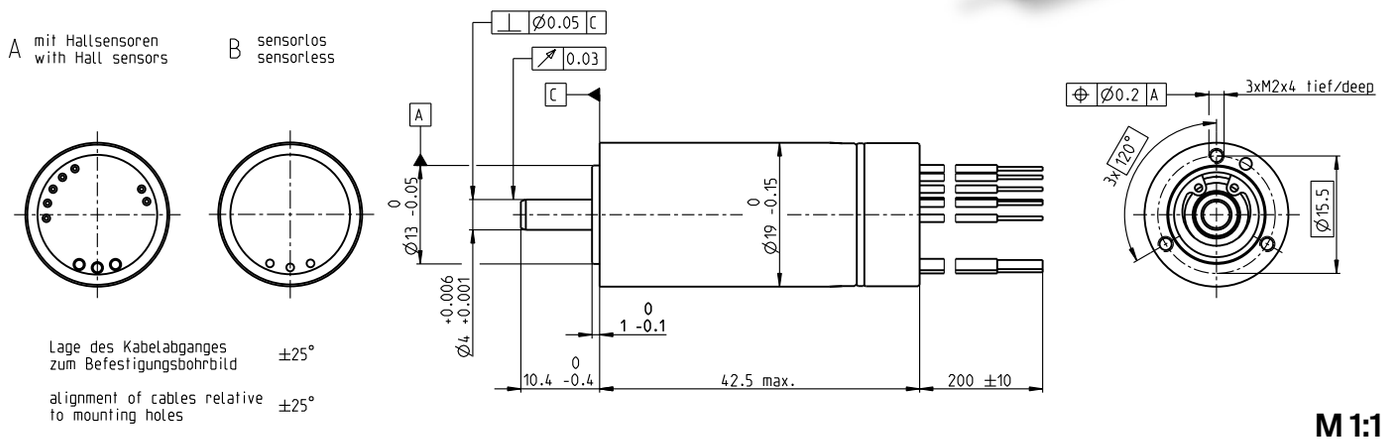
maxon motor control
486_ESCON Module 24/2
487_ESCON 36/3 EC
487_ESCON Module 50/4 EC-S
487_ESCON Module 50/5
489_ESCON 50/5
491_DEC Module 24/2
491_DEC Module 50/5
495_EPOS4 Micro 24/5
496_EPOS4 Mod./Comp. 50/5
497_EPOS4 Comp. 24/5 3-axes
501_EPOS4 50/5
504_EPOS2 P 24/5

Configuration

Flange front: thread holes/center thread
Flange back: plastic ring/external thread/with opening
Shaft front: length/diameter
Shaft rear: length
Electric connection: cable length/pin connection/connector
Temperature Sensor: NTC-Thermistor
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

ECX SPEED 19 M brushless
BLDC motor ∅19 mm
High Power

Key Data: 60/71 W, 11.2 mNm, 65 000 rpm



M 1:1

	Motor Data					
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	61300	59600	59700	58600
3_	No load current	mA	408	293	195	142
4_	Nominal speed	rpm	56800	55200	55400	54400
5_	Nominal torque (max. continuous torque)	mNm	11.2	10.2	10.5	10.8
6_	Nominal current (max. continuous current)	A	4.36	2.91	2	1.5
7_	Stall torque	mNm	189	162	177	183
8_	Stall current	A	67.7	42.4	31	23.5
9_	Max. efficiency	%	85.4	84.4	85.1	85.4
10_	Terminal resistance	Ω	0.266	0.566	1.16	2.04
11_	Terminal inductance	mH	0.0213	0.0398	0.0896	0.166
12_	Torque constant	mNm/A	2.78	3.81	5.72	7.77
13_	Speed constant	rpm/V	3430	2510	1670	1230
14_	Speed/torque gradient	rpm/mNm	327	372	340	323
15_	Mechanical time constant	ms	4.49	5.1	4.66	4.43
16_	Rotor inertia	gcm²	1.31	1.31	1.31	1.31

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	16.8
18_	Thermal resistance winding-housing	K/W	0.75
19_	Thermal time constant winding	s	1.27
20_	Thermal time constant motor	s	696
21_	Ambient temperature	°C	-20...+100
22_	Max. winding temperature	°C	155

	Mechanical data ball bearings		
23_	Max. speed	rpm	65 000
24_	Axial play	mm	0...0.29
	Preload	N	4
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	4
27_	Max. force for press fits (static)	N	70
	(static, shaft supported)	N	5000
28_	Max. radial load [mm from flange]	N	12 [5]

	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	78
32_	Typical noise level [rpm]	dBA	48 [50 000]

Connection A and B, motor (Cable AWG 20)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors (Cable AWG 26)

orange	V_{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 47. In combination with the ENX EASY INT, the orange (V_{cc}) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

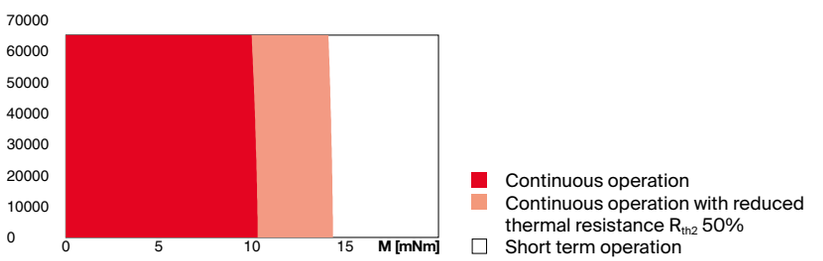
Connection NTC (Cable AWG 26)

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm ±1%, beta (25–85°C): 3490 K

Operating Range

n [rpm] winding 36 V



maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]
335_GPX 19 A/C	1–2 [3–4]
336_GPX 19 LN/LZ	1–2 [3–4]
337_GPX 19 HP	2–3 [4]
338_GPX 19 SPEED	1–2
339_GPX 22 A/C	3–4
340_GPX 22 LN/LZ	3–4
341_GPX 22 HP	4
343_GPX 22 SPEED	[3]

maxon sensor
for motor type A:
441_ENX 19 EASY INT
for motor type B:
441_ENX 19 EASY INT Abs.

maxon motor control
487_ESCON 36/3 EC
487_ESCON Module 50/4 EC-S
487_ESCON Module 50/5
489_ESCON 50/5
491_DEC Module 50/5
495_EPOS4 Micro 24/5
496_EPOS4 Mod./Comp. 50/5
497_EPOS4 Comp. 24/5 3-axes
501_EPOS4 50/5
504_EPOS2 P 24/5

Configuration

Flange front: thread holes/center thread
Flange back: plastic ring/external thread/with opening
Shaft front: length/diameter
Shaft rear: length
Electric connection: cable length/pin connection/connector
Temperature Sensor: NTC-Thermistor
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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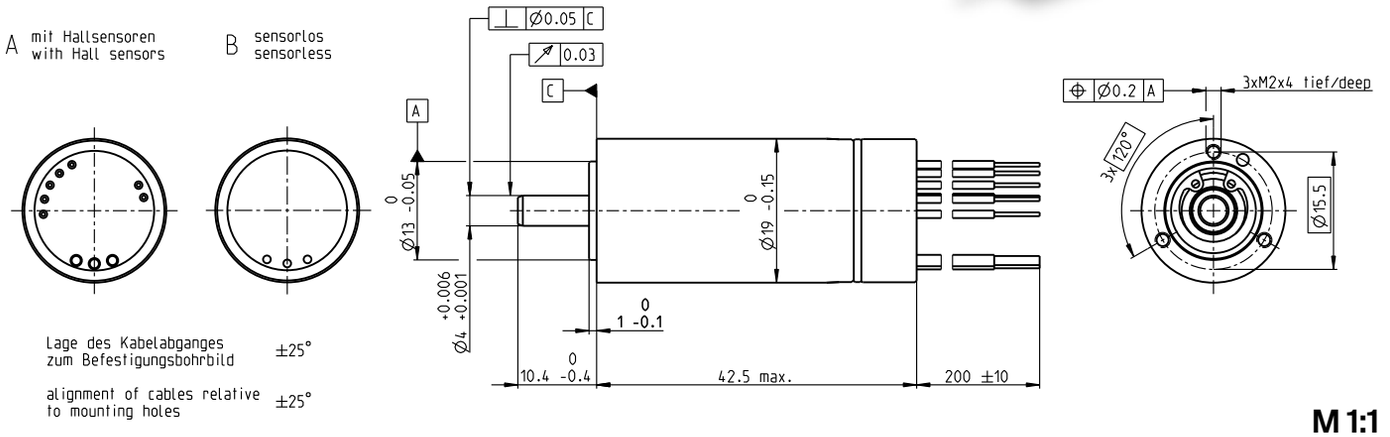
ECX SPEED 19 M brushless
BLDC motor ∅19 mm
Sterilizable

Key Data: 60/65 W, 11.1 mNm, 70 000 rpm



M 1:1

	Motor Data					
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	64800	64600	64600	63400
3_	No load current	mA	207	155	103	75.3
4_	Nominal speed	rpm	59800	59500	59700	58600
5_	Nominal torque (max. continuous torque)	mNm	11.1	9.77	10.1	10.3
6_	Nominal current (max. continuous current)	A	4.32	2.87	1.98	1.48
7_	Stall torque	mNm	179	150	164	169
8_	Stall current	A	67.7	42.4	31	23.5
9_	Max. efficiency	%	89.4	88.4	88.9	89.1
10_	Terminal resistance	Ω	0.266	0.566	1.16	2.04
11_	Terminal inductance	mH	0.0234	0.0438	0.0986	0.182
12_	Torque constant	mNm/A	2.64	3.53	5.3	7.2
13_	Speed constant	rpm/V	3610	2700	1800	1330
14_	Speed/torque gradient	rpm/mNm	363	433	396	376
15_	Mechanical time constant	ms	4.38	5.22	4.77	4.53
16_	Rotor inertia	gcm²	1.15	1.15	1.15	1.15

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	16.8
18_	Thermal resistance winding-housing	K/W	1.6
19_	Thermal time constant winding	s	2.36
20_	Thermal time constant motor	s	696
21_	Ambient temperature	°C	-40...+135
22_	Max. winding temperature	°C	155

	Mechanical data ball bearings		
23_	Max. speed	rpm	70 000
24_	Axial play	mm	0...0.29
	Preload	N	4
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	4
27_	Max. force for press fits (static)	N	70
	(static, shaft supported)	N	5000
28_	Max. radial load [mm from flange]	N	12 [5]

	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	78
32_	Typical noise level [rpm]	dBA	48 [50 000]

Connection A and B, motor (Cable AWG 20)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors (Cable AWG 26)

orange	V_{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 47. In combination with the ENX EASY INT, the orange (V_{cc}) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

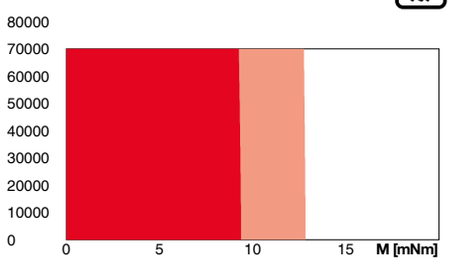
Connection NTC (Cable AWG 26)

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm ±1%, beta (25–85°C): 3490 K

Operating Range

n [rpm] winding 36 V



135°C SSS

Sterilization information

Sterilization cycles
Sensorless: typical 2000
Hall sensors: typical 1000

Sterilization with steam

Temperature	+134°C ±4°C
Compression pressure up to	2.3 bar
Rel. humidity	100%
Cycle length	18 min.

- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Short term operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
338_GPX 19 SPEED	1–2	for motor type A:	487_ESCON 36/3 EC
343_GPX 22 SPEED	[3]	441_ENX 19 EASY INT	487_ESCON Module 50/4 EC-S
		for motor type B:	487_ESCON Module 50/5
		441_ENX 19 EASY INT Abs.	489_ESCON 50/5
			491_DEC Module 50/5
			495_EPOS4 Micro 24/5
			496_EPOS4 Mod./Comp. 50/5
			497_EPOS4 Comp. 24/5 3-axes
			501_EPOS4 50/5
			504_EPOS2 P 24/5

Configuration

Flange front: thread holes/center thread
Flange back: plastic ring/external thread/with opening
Shaft front: length/diameter
Electric connection: cable length/pin connection
Temperature Sensor: NTC-Thermistor
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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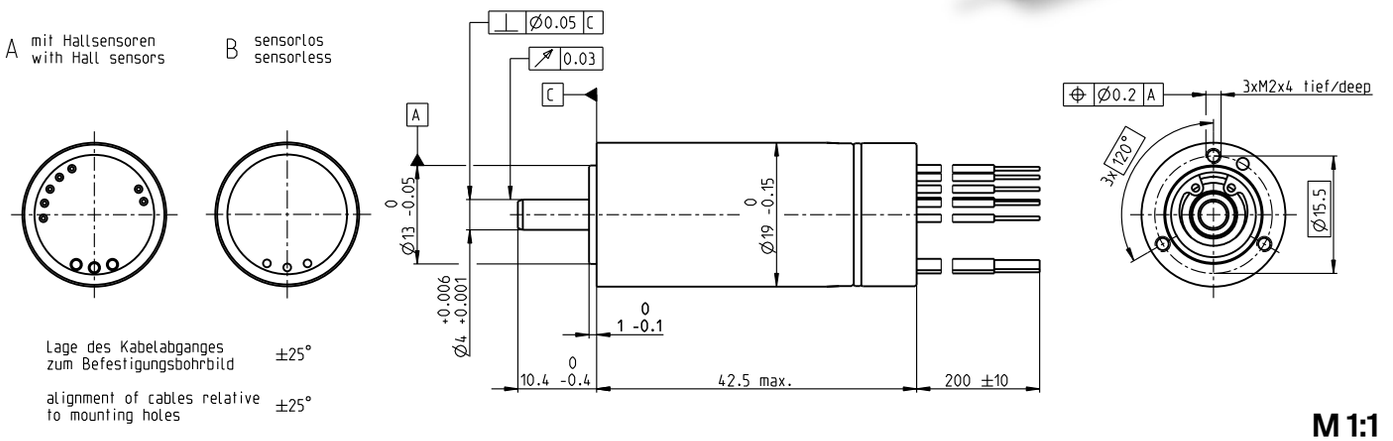
ECX SPEED 19 M brushless
BLDC motor ∅19 mm

Sterilizable, Ceramic Bearings

Key Data: 60/92 W, 10.9 mNm, 100 000 rpm



M 1:1

	Motor Data					
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	64700	64600	64600	63400
3_	No load current	mA	247	185	123	90.1
4_	Nominal speed	rpm	59800	59500	59700	58600
5_	Nominal torque (max. continuous torque)	mNm	10.9	9.65	9.98	10.2
6_	Nominal current (max. continuous current)	A	4.31	2.87	1.97	1.48
7_	Stall torque	mNm	179	150	164	169
8_	Stall current	A	67.7	42.4	31	23.5
9_	Max. efficiency	%	88.4	87.4	87.9	88.1
10_	Terminal resistance	Ω	0.266	0.566	1.16	2.04
11_	Terminal inductance	mH	0.0234	0.0438	0.0986	0.182
12_	Torque constant	mNm/A	2.64	3.53	5.3	7.2
13_	Speed constant	rpm/V	3610	2700	1800	1330
14_	Speed/torque gradient	rpm/mNm	363	433	396	376
15_	Mechanical time constant	ms	4.38	5.22	4.77	4.53
16_	Rotor inertia	gcm²	1.15	1.15	1.15	1.15

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	16.8
18_	Thermal resistance winding-housing	K/W	1.6
19_	Thermal time constant winding	s	2.36
20_	Thermal time constant motor	s	696
21_	Ambient temperature	°C	-40...+135
22_	Max. winding temperature	°C	155
	Mechanical data ball bearings		
23_	Max. speed	rpm	100 000
24_	Axial play	mm	0...0.29
	Preload	N	4
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	4
27_	Max. force for press fits (static)	N	70
	(static, shaft supported)	N	5000
28_	Max. radial load [mm from flange]	N	12 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	78
32_	Typical noise level [rpm]	dBA	48 [50 000]

Connection A and B, motor (Cable AWG 20)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors (Cable AWG 26)

orange	V_{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 47. In combination with the ENX EASY INT, the orange (V_{cc}) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

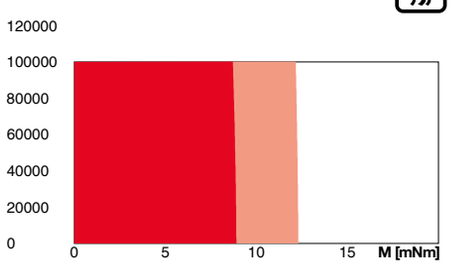
Connection NTC (Cable AWG 26)

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm ±1%, beta (25–85°C): 3490 K

Operating Range

n [rpm] winding 36 V



135°C

Sterilization information

Sterilization cycles
Sensorless: typical 2000
Hall sensors: typical 1000

Sterilization with steam

Temperature	+134°C ±4°C
Compression pressure up to	2.3 bar
Rel. humidity	100%
Cycle length	18 min.

- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Short term operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]
338_GPX 19 SPEED	1–2
343_GPX 22 SPEED	[3]

maxon sensor
for motor type A:
441_ENX 19 EASY INT
for motor type B:
441_ENX 19 EASY INT Abs.

maxon motor control
487_ESCON 36/3 EC
487_ESCON Module 50/4 EC-S
487_ESCON Module 50/5
489_ESCON 50/5
491_DEC Module 50/5
495_EPOS4 Micro 24/5
496_EPOS4 Mod./Comp. 50/5
497_EPOS4 Comp. 24/5 3-axes
501_EPOS4 50/5
504_EPOS2 P 24/5

Configuration

Flange front: thread holes/center thread
Flange back: plastic ring/external thread/with opening
Shaft front: length/diameter
Electric connection: cable length/pin connection
Temperature Sensor: NTC-Thermistor
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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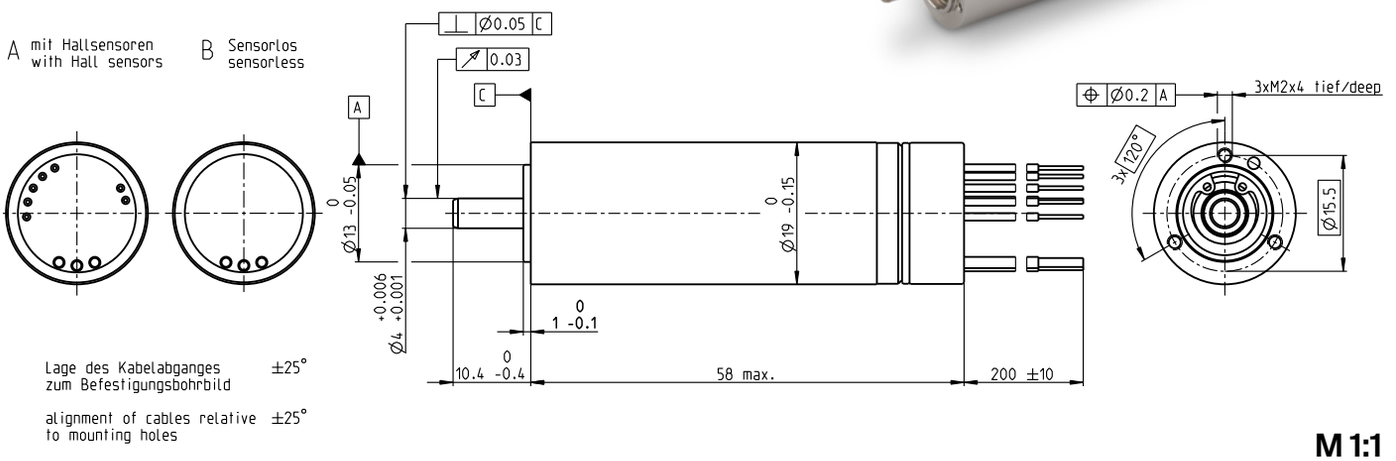
ECX SPEED 19 L brushless
BLDC motor ∅19 mm

Key Data: 60/73 W, 15.3 mNm, 50 000 rpm



M 1:1

	Motor Data				
1_	Nominal voltage	V	18	24	36
2_	No load speed	rpm	47500	48400	49200
3_	No load current	mA	348	269	184
4_	Nominal speed	rpm	43800	44900	45900
5_	Nominal torque (max. continuous torque)	mNm	14.4	15.2	15.3
6_	Nominal current (max. continuous current)	A	4.29	3.45	2.36
7_	Stall torque	mNm	214	251	270
8_	Stall current	A	59.6	53.3	39
9_	Max. efficiency	%	86	87	87
10_	Terminal resistance	Ω	0.302	0.45	0.924
11_	Terminal inductance	mH	0.0217	0.0373	0.0811
12_	Torque constant	mNm/A	3.59	4.71	6.94
13_	Speed constant	rpm/V	2660	2030	1380
14_	Speed/torque gradient	rpm/mNm	223	194	183
15_	Mechanical time constant	ms	3.91	3.39	3.2
16_	Rotor inertia	gcm²	1.67	1.67	1.67

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	13.6
18_	Thermal resistance winding-housing	K/W	1.2
19_	Thermal time constant winding	s	3.62
20_	Thermal time constant motor	s	563
21_	Ambient temperature	°C	-20...+100
22_	Max. winding temperature	°C	155

	Mechanical data ball bearings		
23_	Max. speed	rpm	50 000
24_	Axial play	mm	0...0.29
	Preload	N	4
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	4
27_	Max. force for press fits (static)	N	70
	(static, shaft supported)	N	5000
28_	Max. radial load [mm from flange]	N	12 [5]

	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	108
32_	Typical noise level [rpm]	dBA	51 [50 000]

Connection A and B, motor (Cable AWG 20)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors (Cable AWG 26)

orange	V_{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 47. In combination with the ENX EASY INT, the orange (V_{cc}) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

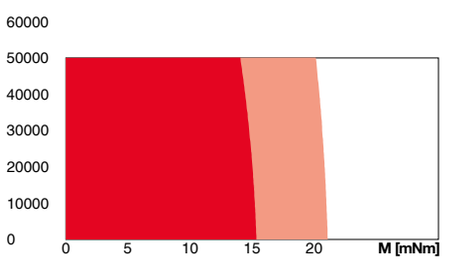
Connection NTC (Cable AWG 26)

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm ±1%, beta (25–85°C): 3490 K

Operating Range

n [rpm] winding 36 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Short term operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]
335_GPX 19 A/C	1–2 [3–4]
336_GPX 19 LN/LZ	1–2 [3–4]
337_GPX 19 HP	2–3 [4]
338_GPX 19 SPEED	1–2
339_GPX 22 A/C	3–4
340_GPX 22 LN/LZ	3–4
341_GPX 22 HP	4
343_GPX 22 SPEED	[3]

maxon sensor
for motor type A:
441_ENX 19 EASY INT
for motor type B:
441_ENX 19 EASY INT Abs.

maxon motor control
487_ESCON 36/3 EC
487_ESCON Module 50/4 EC-S
487_ESCON Module 50/5
489_ESCON 50/5
491_DEC Module 50/5
495_EPOS4 Micro 24/5
496_EPOS4 Module/Comp. 50/5
497_EPOS4 Comp. 24/5 3-axes
501_EPOS4 50/5
504_EPOS2 P 24/5

Configuration

Flange front: thread holes/center thread
Flange back: plastic ring/external thread/with opening
Shaft front: length/diameter
Shaft rear: length
Electric connection: cable length/pin connection/connector
Temperature Sensor: NTC-Thermistor
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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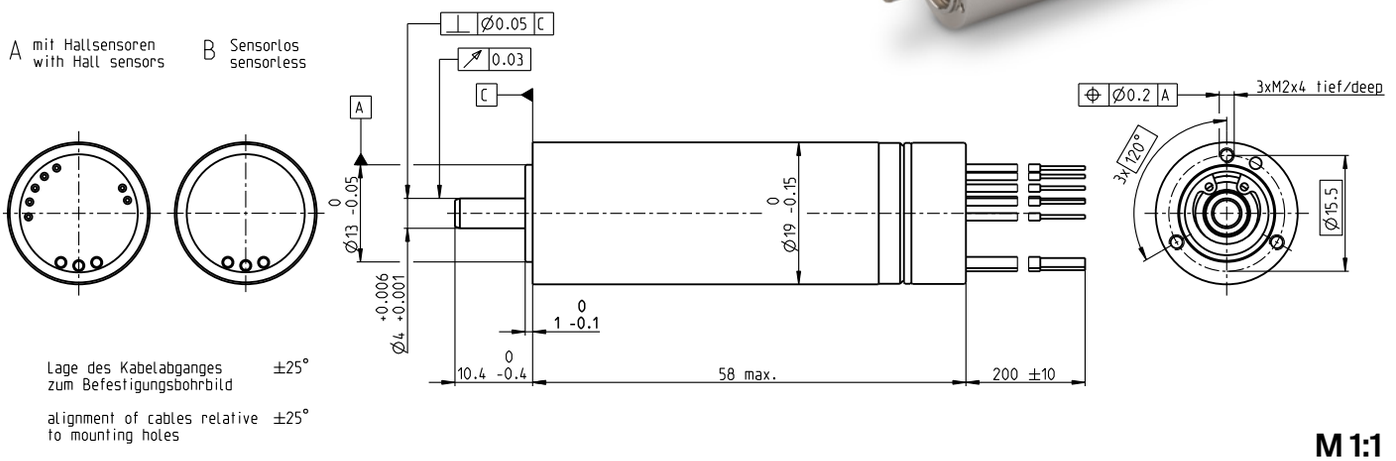
ECX SPEED 19 L brushless
BLDC motor ∅19 mm
High Power

Key Data: 120/133 W, 23.2 mNm, 65 000 rpm



M 1:1

	Motor Data					
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	60900	60900	57700	63500
3_	No load current	mA	351	263	160	142
4_	Nominal speed	rpm	57700	57900	54900	60800
5_	Nominal torque (max. continuous torque)	mNm	22.9	22.6	23.2	22.2
6_	Nominal current (max. continuous current)	A	8.38	6.21	4.01	3.19
7_	Stall torque	mNm	558	598	630	667
8_	Stall current	A	198	159	106	92.6
9_	Max. efficiency	%	91.9	92.1	92.5	92.4
10_	Terminal resistance	Ω	0.0908	0.151	0.34	0.518
11_	Terminal inductance	mH	0.00838	0.0149	0.0373	0.0547
12_	Torque constant	mNm/A	2.82	3.76	5.95	7.2
13_	Speed constant	rpm/V	3390	2540	1600	1330
14_	Speed/torque gradient	rpm/mNm	109	102	91.7	95.4
15_	Mechanical time constant	ms	1.88	1.75	1.58	1.64
16_	Rotor inertia	gcm²	1.64	1.64	1.64	1.64

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	13.6
18_	Thermal resistance winding-housing	K/W	1.32
19_	Thermal time constant winding	s	4.01
20_	Thermal time constant motor	s	563
21_	Ambient temperature	°C	-20...+100
22_	Max. winding temperature	°C	155

	Mechanical data ball bearings		
23_	Max. speed	rpm	65 000
24_	Axial play	mm	0...0.29
	Preload	N	4
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	4
27_	Max. force for press fits (static)	N	70
	(static, shaft supported)	N	5000
28_	Max. radial load [mm from flange]	N	12 [5]

	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	108
32_	Typical noise level [rpm]	dBA	51 [50 000]

Connection A and B, motor (Cable AWG 20)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors (Cable AWG 26)

orange	V_{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 47. In combination with the ENX EASY INT, the orange (V_{cc}) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

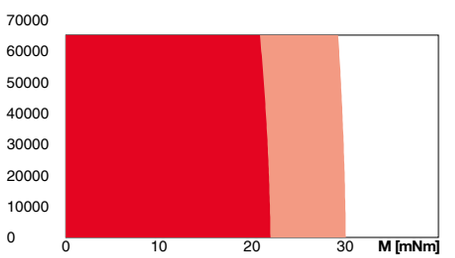
Connection NTC (Cable AWG 26)

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm ±1%, beta (25–85°C): 3490 K

Operating Range

n [rpm] winding 36 V



Continuous operation
Continuous operation with reduced thermal resistance R_{th2} 50%
Short term operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]
335_GPX 19 A/C	1–2 [3–4]
336_GPX 19 LN/LZ	1–2 [3–4]
337_GPX 19 HP	2–3 [4]
338_GPX 19 SPEED	1–2
339_GPX 22 A/C	3–4
340_GPX 22 LN/LZ	3–4
341_GPX 22 HP	4
343_GPX 22 SPEED	[3]

maxon sensor
for motor type A:
441_ENX 19 EASY INT
for motor type B:
441_ENX 19 EASY INT Abs.

maxon motor control
487_ESCON Module 50/4 EC-S
487_ESCON Module 50/5
488_ESCON Module 50/8 HE
489_ESCON 50/5
489_ESCON 70/10
491_DEC Module 50/5
496_EPOS4 Mod./Comp. 50/5
497_EPOS4 Mod./Comp. 50/8
501_EPOS4 50/5
501_EPOS4 70/15
504_EPOS2 P 24/5

Configuration

Flange front: thread holes/center thread
Flange back: plastic ring/external thread/with opening
Shaft front: length/diameter
Shaft rear: length
Electric connection: cable length/pin connection/connector
Temperature Sensor: NTC-Thermistor
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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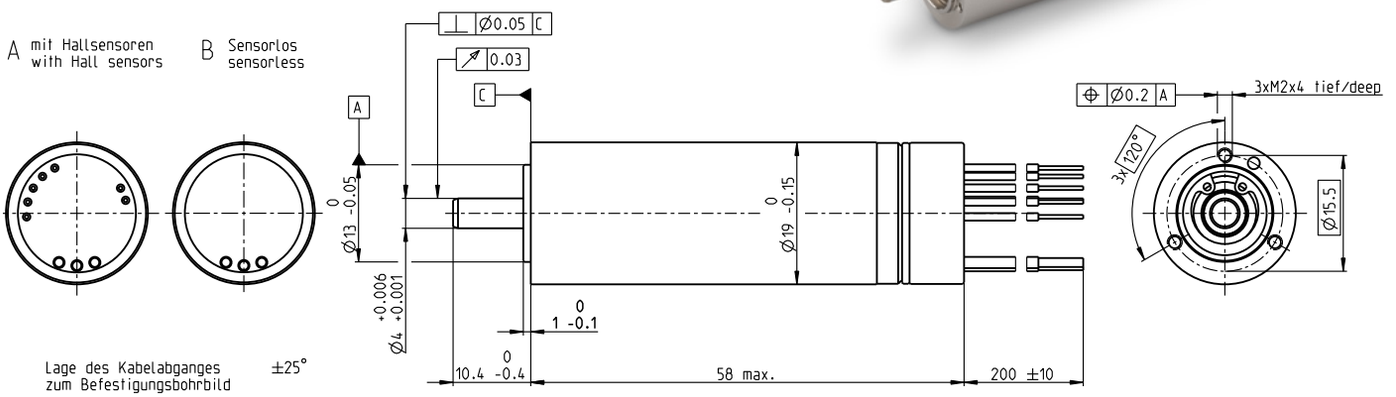
ECX SPEED 19 L brushless
BLDC motor ∅19 mm

Sterilizable

Key Data: 120/147 W, 23.9 mNm, 70 000 rpm

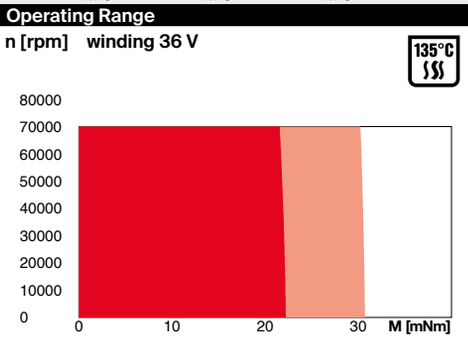


M 1:1

	Motor Data					
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	60800	60800	57600	63400
3_	No load current	mA	426	319	194	172
4_	Nominal speed	rpm	57200	57500	54600	60500
5_	Nominal torque (max. continuous torque)	mNm	23.6	23.3	23.9	23
6_	Nominal current (max. continuous current)	A	8.68	6.43	4.14	3.31
7_	Stall torque	mNm	503	561	613	655
8_	Stall current	A	178	149	103	90.8
9_	Max. efficiency	%	90.6	91.1	91.6	91.6
10_	Terminal resistance	Ω	0.101	0.161	0.35	0.528
11_	Terminal inductance	mH	0.0096	0.0171	0.0428	0.0627
12_	Torque constant	mNm/A	2.82	3.76	5.95	7.21
13_	Speed constant	rpm/V	3390	2540	1600	1320
14_	Speed/torque gradient	rpm/mNm	121	109	94.2	97.1
15_	Mechanical time constant	ms	2.27	2.04	1.77	1.82
16_	Rotor inertia	gcm²	1.79	1.79	1.79	1.79

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	13.6
18_	Thermal resistance winding-housing	K/W	0.9
19_	Thermal time constant winding	s	2.79
20_	Thermal time constant motor	s	563
21_	Ambient temperature	°C	-40...+135
22_	Max. winding temperature	°C	155
	Mechanical data ball bearings		
23_	Max. speed	rpm	70 000
24_	Axial play	mm	0...0.29
	Preload	N	4
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	4
27_	Max. force for press fits (static)	N	70
	(static, shaft supported)	N	5000
28_	Max. radial load [mm from flange]	N	12 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	108
32_	Typical noise level [rpm]	dBA	51 [50 000]

Operating Range



Sterilization information

135°C SS

Sterilization cycles
Sensorless: typical 2000
Hall sensors: typical 1000

Sterilization with steam

Temperature	+134°C ±4°C
Compression pressure up to	2.3 bar
Rel. humidity	100%
Cycle length	18 min.

- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Short term operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
338_GPX 19 SPEED	1–2	for motor type A:	487_ESCON Module 50/4 EC-S
343_GPX 22 SPEED	[3]	441_ENX 19 EASY INT	487_ESCON Module 50/5
		for motor type B:	488_ESCON Module 50/8 HE
		441_ENX 19 EASY INT Abs.	489_ESCON 50/5
			489_ESCON 70/10
			491_DEC Module 50/5
			496_EPOS4 Mod./Comp. 50/5
			497_EPOS4 Mod./Comp. 50/8
			501_EPOS4 50/5
			501_EPOS4 70/15
			504_EPOS2 P 24/5

Connection A and B, motor (Cable AWG 20)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors (Cable AWG 26)

orange	V_{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 47. In combination with the ENX EASY INT, the orange (V_{cc}) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

Connection NTC (Cable AWG 26)

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm ±1%, beta (25–85°C): 3490 K

Configuration

Flange front: thread holes/center thread
Flange back: plastic ring/external thread/with opening
Shaft front: length/diameter
Electric connection: cable length/pin connection
Temperature Sensor: NTC-Thermistor
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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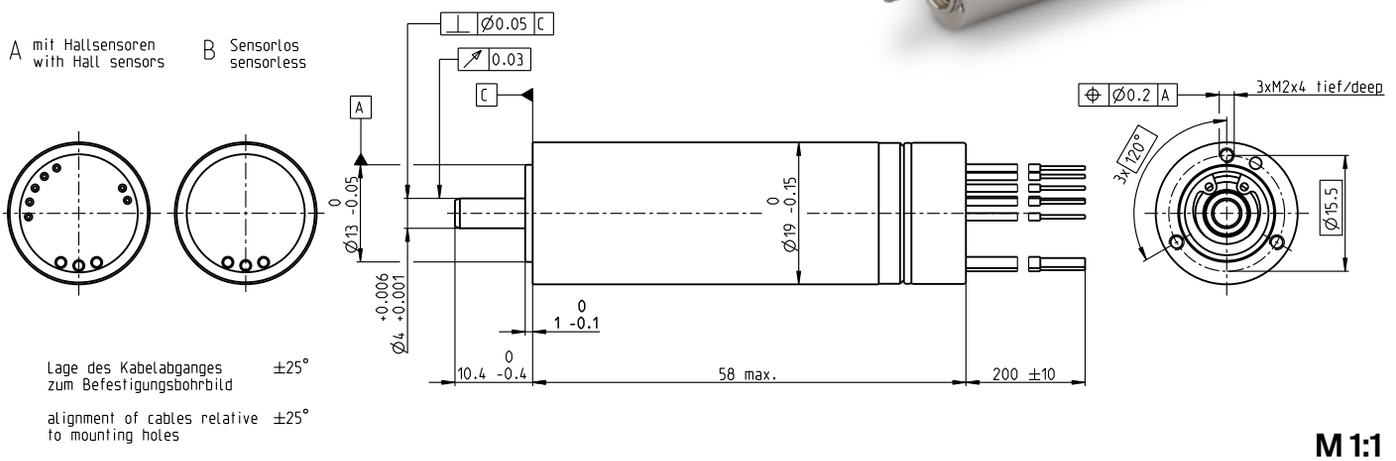
ECX SPEED 19 L brushless
BLDC motor ∅19 mm

Sterilizable, Ceramic Bearings

Key Data: 120/206 W, 24.1 mNm, 100 000 rpm

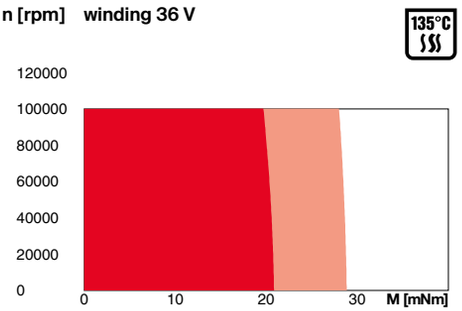


M 1:1

	Motor Data					
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	60800	60800	57600	63400
3_	No load current	mA	376	282	172	152
4_	Nominal speed	rpm	57200	57500	54600	60400
5_	Nominal torque (max. continuous torque)	mNm	23.9	23.6	24.1	23.2
6_	Nominal current (max. continuous current)	A	8.71	6.45	4.16	3.32
7_	Stall torque	mNm	503	561	613	655
8_	Stall current	A	178	149	103	90.8
9_	Max. efficiency	%	91.2	91.6	92.1	92.1
10_	Terminal resistance	Ω	0.101	0.161	0.35	0.528
11_	Terminal inductance	mH	0.0096	0.0171	0.0428	0.0627
12_	Torque constant	mNm/A	2.82	3.76	5.95	7.21
13_	Speed constant	rpm/V	3390	2540	1600	1320
14_	Speed/torque gradient	rpm/mNm	121	109	94.2	97.1
15_	Mechanical time constant	ms	2.27	2.04	1.77	1.82
16_	Rotor inertia	gcm²	1.79	1.79	1.79	1.79

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	13.6
18_	Thermal resistance winding-housing	K/W	0.9
19_	Thermal time constant winding	s	2.79
20_	Thermal time constant motor	s	563
21_	Ambient temperature	°C	-40...+135
22_	Max. winding temperature	°C	155
	Mechanical data ball bearings		
23_	Max. speed	rpm	100 000
24_	Axial play	mm	0...0.29
	Preload	N	4
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	4
27_	Max. force for press fits (static)	N	70
	(static, shaft supported)	N	5000
28_	Max. radial load [mm from flange]	N	12 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	108
32_	Typical noise level [rpm]	dBA	51 [50 000]

Operating Range



Sterilization information

135°C SS

Sterilization cycles
Sensorless: typical 2000
Hall sensors: typical 1000

Sterilization with steam

Temperature	+134°C ±4°C
Compression pressure up to	2.3 bar
Rel. humidity	100%
Cycle length	18 min.

- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Short term operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]
338_GPX 19 SPEED	1–2
343_GPX 22 SPEED	[3]

maxon sensor
for motor type A:
441_ENX 19 EASY INT
for motor type B:
441_ENX 19 EASY INT Abs.

maxon motor control
487_ESCON Module 50/4 EC-S
487_ESCON Module 50/5
488_ESCON Module 50/8 HE
489_ESCON 50/5
489_ESCON 70/10
491_DEC Module 50/5
496_EPOS4 Mod./Comp. 50/5
497_EPOS4 Mod./Comp. 50/8
501_EPOS4 50/5
501_EPOS4 70/15
504_EPOS2 P 24/5

Connection A and B, motor (Cable AWG 20)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors (Cable AWG 26)

orange	V_{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 47. In combination with the ENX EASY INT, the orange (V_{cc}) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

Connection NTC (Cable AWG 26)

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm ±1%, beta (25–85°C): 3490 K

Configuration

Flange front: thread holes/center thread
Flange back: plastic ring/external thread/with opening
Shaft front: length/diameter
Electric connection: cable length/pin connection
Temperature Sensor: NTC-Thermistor
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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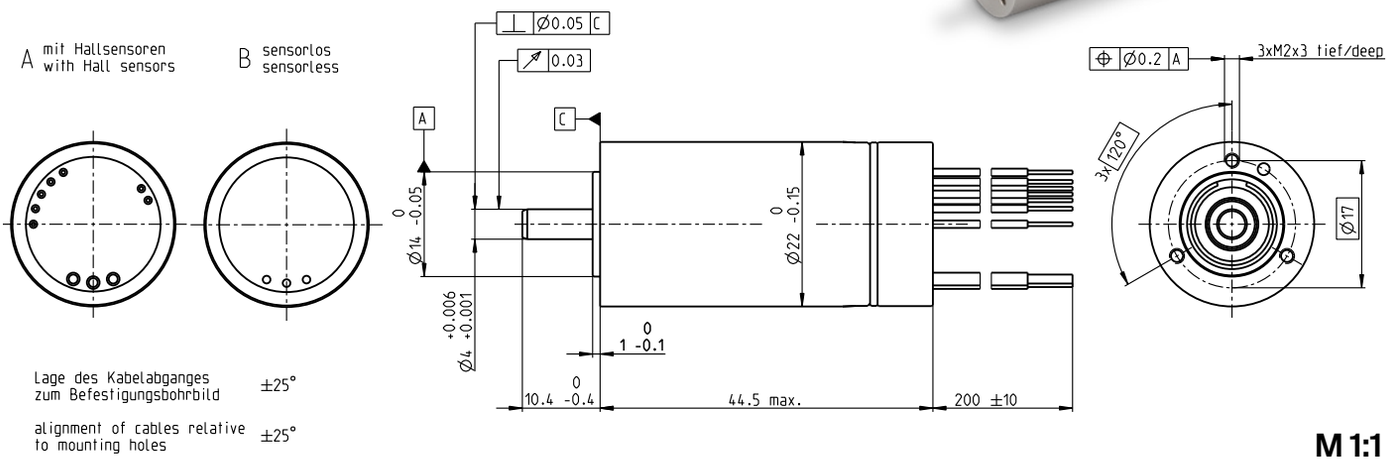
ECX SPEED 22 M brushless
BLDC motor ∅22 mm

Key Data: 40/51 W, 12.1 mNm, 45 000 rpm



M 1:1

	Motor Data					
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	40400	40000	40500	40400
3_	No load current	mA	378	279	189	141
4_	Nominal speed	rpm	37300	37100	37700	37500
5_	Nominal torque (max. continuous torque)	mNm	10.7	11.5	12.1	11.9
6_	Nominal current (max. continuous current)	A	2.89	2.28	1.61	1.18
7_	Stall torque	mNm	154	175	196	189
8_	Stall current	A	36.5	30.8	23.3	16.8
9_	Max. efficiency	%	81.1	82.2	83.1	82.8
10_	Terminal resistance	Ω	0.493	0.779	1.54	2.86
11_	Terminal inductance	mH	0.0272	0.0495	0.109	0.194
12_	Torque constant	mNm/A	4.2	5.67	8.4	11.2
13_	Speed constant	rpm/V	2270	1680	1140	850
14_	Speed/torque gradient	rpm/mNm	266	231	209	216
15_	Mechanical time constant	ms	5.94	5.16	4.65	4.82
16_	Rotor inertia	gcm²	2.13	2.13	2.13	2.13

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	15
18_	Thermal resistance winding-housing	K/W	1.34
19_	Thermal time constant winding	s	2.71
20_	Thermal time constant motor	s	417
21_	Ambient temperature	°C	-20...+100
22_	Max. winding temperature	°C	155
	Mechanical data ball bearings		
23_	Max. speed	rpm	45 000
24_	Axial play	mm	0...0.24
	Preload	N	4
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	4
27_	Max. force for press fits (static)	N	110
	(static, shaft supported)	N	6000
28_	Max. radial load [mm from flange]	N	16 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	98
32_	Typical noise level [rpm]	dBA	53 [45 000]

Connection A and B, motor (Cable AWG 18)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors (Cable AWG 26)

orange	V_{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 47. In combination with the ENX EASY INT, the orange (V_{cc}) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

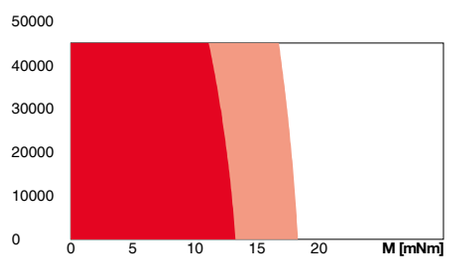
Connection NTC (Cable AWG 26)

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm ±1%, beta (25–85°C): 3490 K

Operating Range

n [rpm] winding 36 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Short term operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
339_GPX 22 A/C	1–2 [3–4]	for motor type A:	487_ESCON 36/3 EC
340_GPX 22 LN/LZ	1–2 [3–4]	442_ENX 22 EASY INT	487_ESCON Module 50/4 EC-S
341_GPX 22 HP	2–3 [4]	for motor type B:	487_ESCON Module 50/5
342_GPX 22 UP	1–4	442_ENX 22 EASY INT Abs.	489_ESCON 50/5
343_GPX 22 SPEED	1–2		491_DEC Module 50/5
344_GPX 26 A/C	3		495_EPOS4 Micro 24/5
345_GPX 26 LN/LZ	3		496_EPOS4 Mod./Comp. 50/5
346_GPX 26 HP	4		497_EPOS4 Comp. 24/5 3-axes
			501_EPOS4 50/5
			504_EPOS2 P 24/5

Configuration

Flange front: thread holes/center thread
Flange back: plastic ring/external thread/with opening
Shaft front: length/diameter
Shaft rear: length
Electric connection: cable length/pin connection/connector
Temperature Sensor: NTC-Thermistor
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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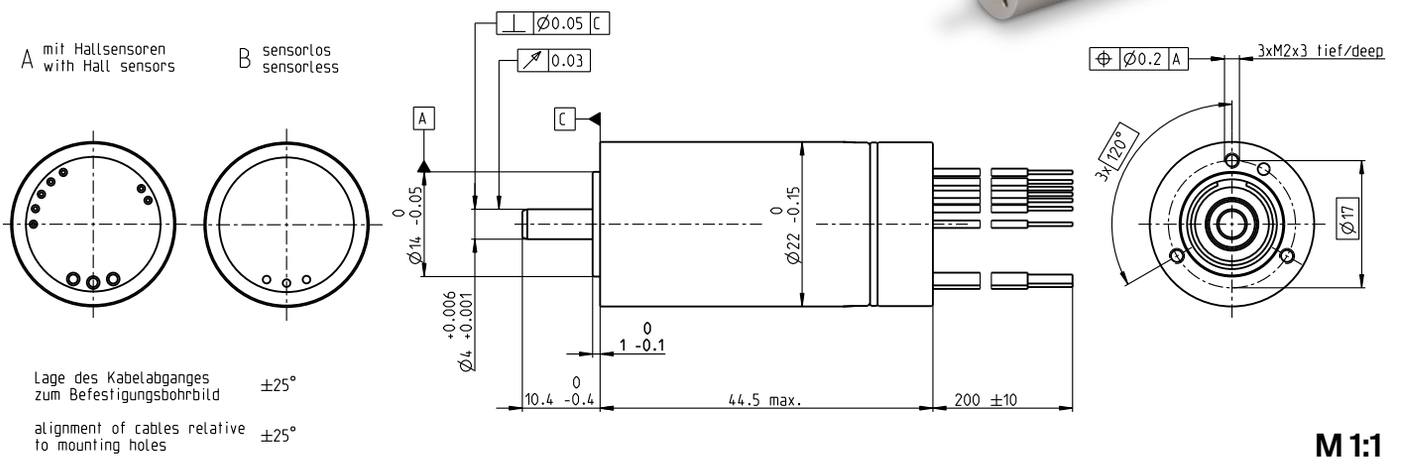
ECX SPEED 22 M brushless
BLDC motor ∅22 mm
High Power

Key Data: 80/115 W, 20.3 mNm, 60 000 rpm



M 1:1

	Motor Data					
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	50900	58100	55500	52500
3_	No load current	mA	324	302	186	128
4_	Nominal speed	rpm	48200	55600	53000	49900
5_	Nominal torque (max. continuous torque)	mNm	20.3	20.1	20	18.3
6_	Nominal current (max. continuous current)	A	6.28	5.36	3.4	2.21
7_	Stall torque	mNm	454	549	537	425
8_	Stall current	A	135	140	87	48.8
9_	Max. efficiency	%	90.6	91	91.1	90.2
10_	Terminal resistance	Ω	0.133	0.172	0.414	0.983
11_	Terminal inductance	mH	0.00978	0.0133	0.0329	0.0653
12_	Torque constant	mNm/A	3.37	3.93	6.18	8.7
13_	Speed constant	rpm/V	2830	2430	1550	1100
14_	Speed/torque gradient	rpm/mNm	112	106	104	124
15_	Mechanical time constant	ms	2.53	2.39	2.33	2.79
16_	Rotor inertia	gcm²	2.15	2.15	2.15	2.15

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	15
18_	Thermal resistance winding-housing	K/W	0.6
19_	Thermal time constant winding	s	1.22
20_	Thermal time constant motor	s	417
21_	Ambient temperature	°C	-20...+100
22_	Max. winding temperature	°C	155

	Mechanical data ball bearings		
23_	Max. speed	rpm	60 000
24_	Axial play	mm	0...0.24
	Preload	N	4
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	4
27_	Max. force for press fits (static)	N	110
	(static, shaft supported)	N	6000
28_	Max. radial load [mm from flange]	N	16 [5]

	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	98
32_	Typical noise level [rpm]	dBA	53 [50 000]

Connection A and B, motor (Cable AWG 18)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors (Cable AWG 26)

orange	V_{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 47. In combination with the ENX EASY INT, the orange (V_{cc}) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

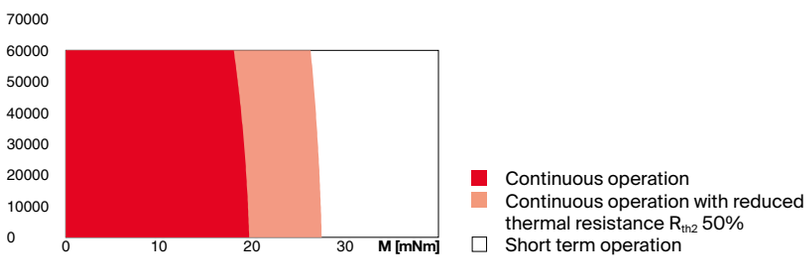
Connection NTC (Cable AWG 26)

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm ±1%, beta (25–85°C): 3490 K

Operating Range

n [rpm] winding 36 V



maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor
339_GPX 22 A/C	1–2 [3–4]	for motor type A:
340_GPX 22 LN/LZ	1–2 [3–4]	442_ENX 22 EASY INT
341_GPX 22 HP	2–3 [4]	for motor type B:
342_GPX 22 UP	1–4	442_ENX 22 EASY INT Abs.
343_GPX 22 SPEED	1–2	
344_GPX 26 A/C	3	
345_GPX 26 LN/LZ	3	
346_GPX 26 HP	4	

maxon motor control
487_ESCON Module 50/4 EC-S
487_ESCON Module 50/5
488_ESCON Module 50/8 HE
489_ESCON 50/5
489_ESCON 70/10
491_DEC Module 50/5
496_EPOS4 Mod./Comp. 50/5
497_EPOS4 Mod./Comp. 50/8
501_EPOS4 50/5
501_EPOS4 70/15
504_EPOS2 P 24/5

Configuration

Flange front: thread holes/center thread
Flange back: plastic ring/external thread/with opening
Shaft front: length/diameter
Shaft rear: length
Electric connection: cable length/pin connection/connector
Temperature Sensor: NTC-Thermistor
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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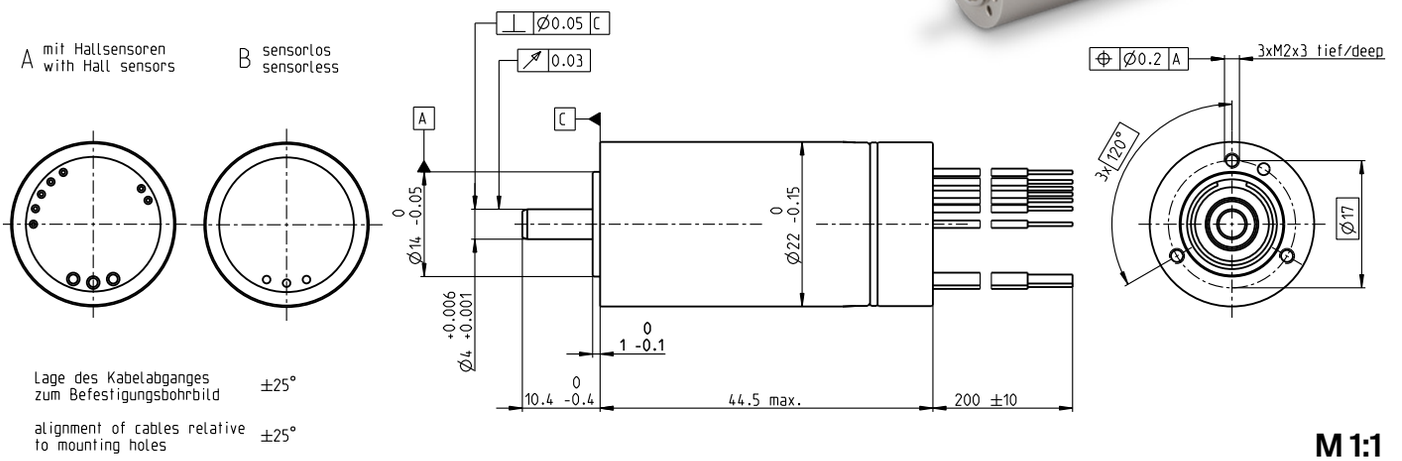
ECX SPEED 22 M brushless
BLDC motor ∅22 mm
Sterilizable

Key Data: 80/97 W, 17.6 mNm, 60 000 rpm



M 1:1

	Motor Data					
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	52800	54800	56900	54800
3_	No load current	mA	280	222	157	111
4_	Nominal speed	rpm	49800	51800	53900	51800
5_	Nominal torque (max. continuous torque)	mNm	17.6	17.6	16.9	17.1
6_	Nominal current (max. continuous current)	A	5.65	4.4	2.93	2.15
7_	Stall torque	mNm	340	365	362	361
8_	Stall current	A	105	87.5	60.1	43.3
9_	Max. efficiency	%	90	90.3	90.2	90.2
10_	Terminal resistance	Ω	0.172	0.274	0.599	1.11
11_	Terminal inductance	mH	0.00934	0.0154	0.0322	0.0617
12_	Torque constant	mNm/A	3.24	4.17	6.02	8.34
13_	Speed constant	rpm/V	2940	2290	1590	1150
14_	Speed/torque gradient	rpm/mNm	156	151	158	152
15_	Mechanical time constant	ms	3.12	3.01	3.15	3.05
16_	Rotor inertia	gcm²	1.91	1.91	1.91	1.91

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	15
18_	Thermal resistance winding-housing	K/W	0.6
19_	Thermal time constant winding	s	1.25
20_	Thermal time constant motor	s	417
21_	Ambient temperature	°C	-40...+135
22_	Max. winding temperature	°C	155

	Mechanical data ball bearings		
23_	Max. speed	rpm	60 000
24_	Axial play	mm	0...0.24
	Preload	N	4
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	4
27_	Max. force for press fits (static)	N	110
	(static, shaft supported)	N	6000
28_	Max. radial load [mm from flange]	N	16 [5]

	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	106
32_	Typical noise level [rpm]	dBA	54 [50 000]

Connection A and B, motor (Cable AWG 18)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors (Cable AWG 26)

orange	V_{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 47. In combination with the ENX EASY INT, the orange (V_{cc}) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

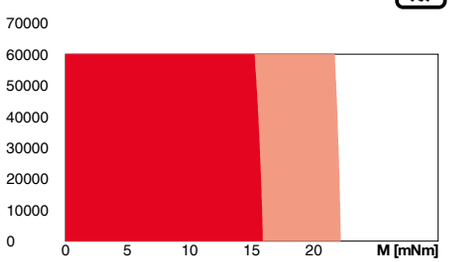
Connection NTC (Cable AWG 26)

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm ±1%, beta (25–85°C): 3490 K

Operating Range

n [rpm] winding 36 V



135°C SSS

Sterilization information

Sterilization cycles
Sensorless: typical 2000
Hall sensors: typical 1000

Sterilization with steam

Temperature	+134°C ±4°C
Compression pressure up to	2.3 bar
Rel. humidity	100%
Cycle length	18 min.

- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Short term operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
343_GPX 22 SPEED	1–2	for motor type A: 442_ENX 22 EASY INT for motor type B: 442_ENX 22 EASY INT Abs.	487_ESCON Module 50/4 EC-S 487_ESCON Module 50/5 488_ESCON Module 50/8 HE 489_ESCON 50/5 489_ESCON 70/10 491_DEC Module 50/5 495_EPOS4 Micro 24/5 496_EPOS4 Mod./Comp. 50/5 497_EPOS4 Comp. 24/5 3-axes 497_EPOS4 Mod./Comp. 50/8 501_EPOS4 50/5 501_EPOS4 70/15 504_EPOS2 P 24/5

Configuration

Flange front: thread holes/center thread
Flange back: plastic ring/external thread/with opening
Shaft front: length/diameter
Electric connection: cable length/pin connection
Temperature Sensor: NTC-Thermistor
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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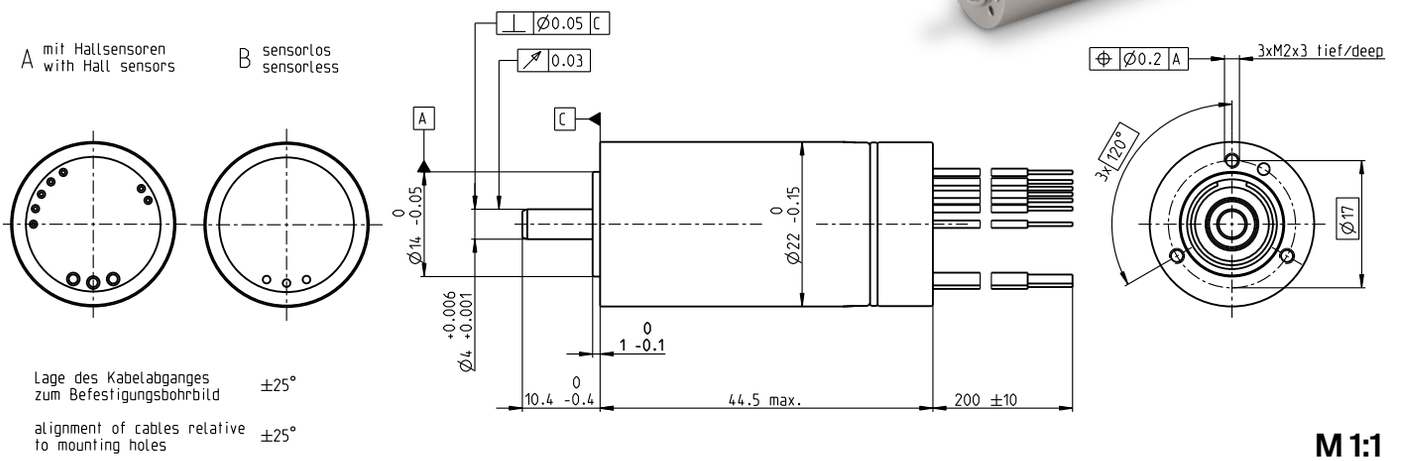
ECX SPEED 22 M brushless
BLDC motor ∅22 mm

Sterilizable, Ceramic Bearings

Key Data: 80/127 W, 16.9 mNm, 85 000 rpm



M 1:1

	Motor Data					
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	52800	54700	56800	54700
3_	No load current	mA	391	311	221	156
4_	Nominal speed	rpm	49800	51900	54000	51900
5_	Nominal torque (max. continuous torque)	mNm	16.9	16.9	16.1	16.5
6_	Nominal current (max. continuous current)	A	5.56	4.32	2.87	2.11
7_	Stall torque	mNm	340	365	362	361
8_	Stall current	A	105	87.5	60.1	43.3
9_	Max. efficiency	%	88.4	88.6	88.4	88.6
10_	Terminal resistance	Ω	0.172	0.274	0.599	1.11
11_	Terminal inductance	mH	0.00934	0.0154	0.0322	0.0617
12_	Torque constant	mNm/A	3.24	4.17	6.02	8.34
13_	Speed constant	rpm/V	2940	2290	1590	1150
14_	Speed/torque gradient	rpm/mNm	156	151	158	152
15_	Mechanical time constant	ms	3.12	3.01	3.15	3.05
16_	Rotor inertia	gcm²	1.91	1.91	1.91	1.91

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	15
18_	Thermal resistance winding-housing	K/W	0.6
19_	Thermal time constant winding	s	1.25
20_	Thermal time constant motor	s	417
21_	Ambient temperature	°C	-40...+135
22_	Max. winding temperature	°C	155

	Mechanical data ball bearings		
23_	Max. speed	rpm	85 000
24_	Axial play	mm	0...0.24
	Preload	N	4
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	4
27_	Max. force for press fits (static)	N	110
	(static, shaft supported)	N	6000
28_	Max. radial load [mm from flange]	N	16 [5]

	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	106
32_	Typical noise level [rpm]	dBA	54 [50 000]

Connection A and B, motor (Cable AWG 18)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors (Cable AWG 26)

orange	V_{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 47. In combination with the ENX EASY INT, the orange (V_{cc}) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

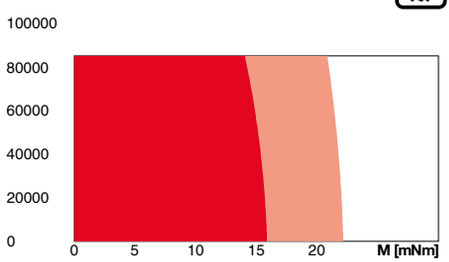
Connection NTC (Cable AWG 26)

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm ±1%, beta (25–85°C): 3490 K

Operating Range

n [rpm] winding 36 V



135°C

Sterilization information

Sterilization cycles
Sensorless: typical 2000
Hall sensors: typical 1000

Sterilization with steam

Temperature	+134°C ±4°C
Compression pressure up to	2.3 bar
Rel. humidity	100%
Cycle length	18 min.

- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Short term operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
343_GPX 22 SPEED	1–2	for motor type A: 442_ENX 22 EASY INT for motor type B: 442_ENX 22 EASY INT Abs.	487_ESCON Module 50/4 EC-S 487_ESCON Module 50/5 488_ESCON Module 50/8 HE 489_ESCON 50/5 489_ESCON 70/10 491_DEC Module 50/5 495_EPOS4 Micro 24/5 496_EPOS4 Mod./Comp. 50/5 497_EPOS4 Comp. 24/5 3-axes 497_EPOS4 Mod./Comp. 50/8 501_EPOS4 50/5 501_EPOS4 70/15 504_EPOS2 P 24/5

Configuration

Flange front: thread holes/center thread
Flange back: plastic ring/external thread/with opening
Shaft front: length/diameter
Electric connection: cable length/pin connection
Temperature Sensor: NTC-Thermistor
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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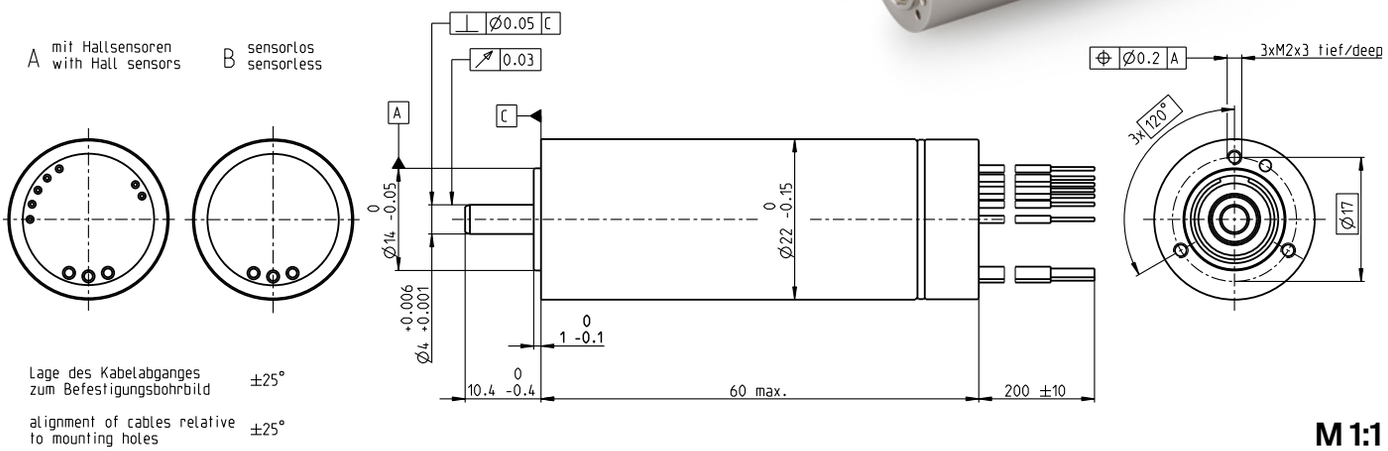
ECX SPEED 22 L brushless
BLDC motor ∅22 mm

Key Data: 80/81 W, 20.2 mNm, 45 000 rpm



M 1:1

	Motor Data				
1_	Nominal voltage	V	24	36	48
2_	No load speed	rpm	38000	36800	37400
3_	No load current	mA	337	214	164
4_	Nominal speed	rpm	36000	34800	35600
5_	Nominal torque (max. continuous torque)	mNm	18.2	19.3	20.2
6_	Nominal current (max. continuous current)	A	3.35	2.27	1.8
7_	Stall torque	mNm	383	407	461
8_	Stall current	A	64	43.8	37.8
9_	Max. efficiency	%	86.2	86.7	87.4
10_	Terminal resistance	Ω	0.375	0.823	1.27
11_	Terminal inductance	mH	0.0234	0.0563	0.0968
12_	Torque constant	mNm/A	5.99	9.29	12.2
13_	Speed constant	rpm/V	1590	1030	784
14_	Speed/torque gradient	rpm/mNm	99.9	91	81.7
15_	Mechanical time constant	ms	4.07	3.71	3.33
16_	Rotor inertia	gcm²	3.89	3.89	3.89

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	12.7
18_	Thermal resistance winding-housing	K/W	0.62
19_	Thermal time constant winding	s	1.95
20_	Thermal time constant motor	s	644
21_	Ambient temperature	°C	-20...+100
22_	Max. winding temperature	°C	155
	Mechanical data ball bearings		
23_	Max. speed	rpm	45 000
24_	Axial play	mm	0...0.24
	Preload	N	4
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	4
27_	Max. force for press fits (static)	N	110
	(static, shaft supported)	N	6000
28_	Max. radial load [mm from flange]	N	16 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	140
32_	Typical noise level [rpm]	dBA	54 [45 000]

Connection A and B, motor (Cable AWG 18)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors (Cable AWG 26)

orange	V_{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 47. In combination with the ENX EASY INT, the orange (V_{cc}) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

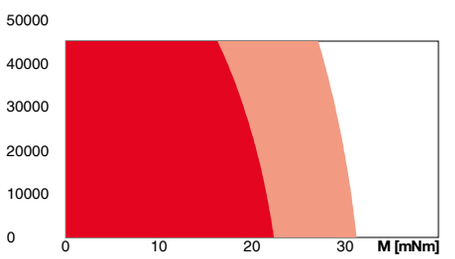
Connection NTC (Cable AWG 26)

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm ±1%, beta (25–85°C): 3490 K

Operating Range

n [rpm] winding 36 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Short term operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]
339_GPX 22 A/C	1–2 [3–4]
340_GPX 22 LN/LZ	1–2 [3–4]
341_GPX 22 HP	2–3 [4]
342_GPX 22 UP	1–4
343_GPX 22 SPEED	1–2
344_GPX 26 A/C	3
345_GPX 26 LN/LZ	3
346_GPX 26 HP	4

maxon sensor
for motor type A:
442_ENX 22 EASY INT
for motor type B:
442_ENX 22 EASY INT Abs.

maxon motor control
487_ESCON 36/3 EC
487_ESCON Module 50/4 EC-S
487_ESCON Module 50/5
489_ESCON 50/5
491_DEC Module 50/5
495_EPOS4 Micro 24/5
496_EPOS4 Mod./Comp. 50/5
497_EPOS4 Comp. 24/5 3-axes
501_EPOS4 50/5
504_EPOS2 P 24/5

Configuration

Flange front: thread holes/center thread
Flange back: plastic ring/external thread/with opening
Shaft front: length/diameter
Shaft rear: length
Electric connection: cable length/pin connection/connector
Temperature Sensor: NTC-Thermistor
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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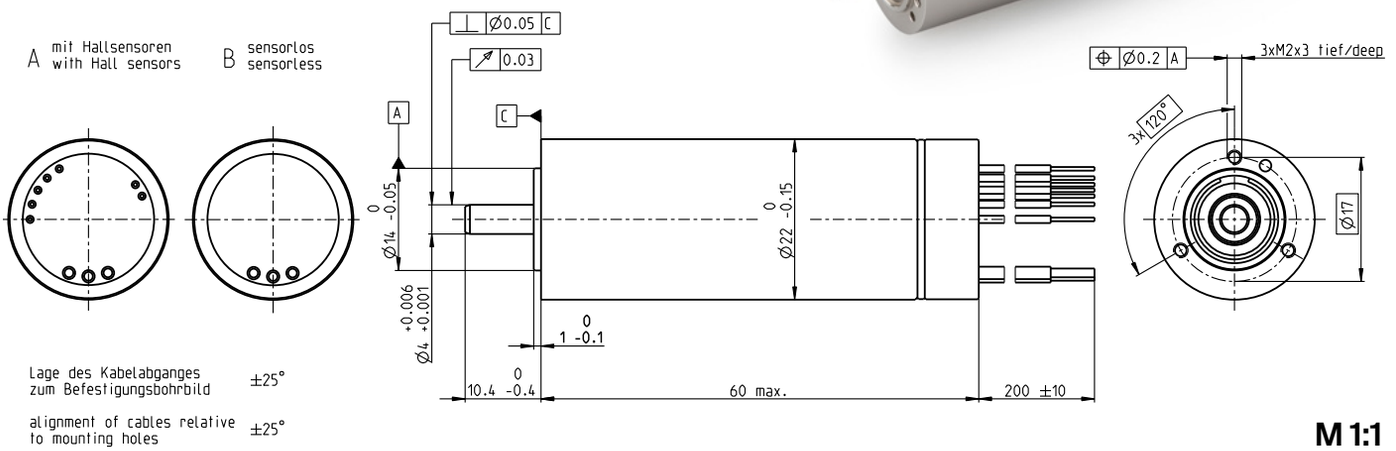
ECX SPEED 22 L brushless
BLDC motor ∅22 mm

High Power

Key Data: 120/153 W, 29.3 mNm, 60 000 rpm



M 1:1

	Motor Data				
1_	Nominal voltage	V	24	36	48
2_	No load speed	rpm	49400	51400	52400
3_	No load current	mA	432	307	238
4_	Nominal speed	rpm	47800	49900	50900
5_	Nominal torque (max. continuous torque)	mNm	29.1	29.3	27.4
6_	Nominal current (max. continuous current)	A	6.67	4.67	3.36
7_	Stall torque	mNm	1080	1290	1230
8_	Stall current	A	233	193	141
9_	Max. efficiency	%	91.7	92.3	92
10_	Terminal resistance	Ω	0.103	0.187	0.341
11_	Terminal inductance	mH	0.009	0.0188	0.0321
12_	Torque constant	mNm/A	4.63	6.68	8.74
13_	Speed constant	rpm/V	2060	1430	1090
14_	Speed/torque gradient	rpm/mNm	45.9	40	42.6
15_	Mechanical time constant	ms	1.9	1.65	1.76
16_	Rotor inertia	gcm²	3.94	3.94	3.94

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	12.2
18_	Thermal resistance winding-housing	K/W	0.841
19_	Thermal time constant winding	s	2.77
20_	Thermal time constant motor	s	619
21_	Ambient temperature	°C	-20...+100
22_	Max. winding temperature	°C	155

	Mechanical data ball bearings		
23_	Max. speed	rpm	60 000
24_	Axial play	mm	0...0.24
	Preload	N	4
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	4
27_	Max. force for press fits (static)	N	110
	(static, shaft supported)	N	6000
28_	Max. radial load [mm from flange]	N	16 [5]

	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	140
32_	Typical noise level [rpm]	dBA	54 [50 000]

Connection A and B, motor (Cable AWG 18)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors (Cable AWG 26)

orange	V_{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 47. In combination with the ENX EASY INT, the orange (V_{cc}) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

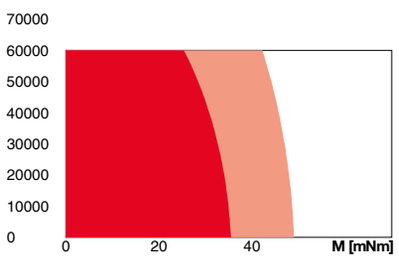
Connection NTC (Cable AWG 26)

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm ±1%, beta (25–85°C): 3490 K

Operating Range

n [rpm] winding 36 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Short term operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]
339_GPX 22 A/C	1–2 [3–4]
340_GPX 22 LN/LZ	1–2 [3–4]
341_GPX 22 HP	2–3 [4]
342_GPX 22 UP	1–4
343_GPX 22 SPEED	1–2
344_GPX 26 A/C	3
345_GPX 26 LN/LZ	3
346_GPX 26 HP	4

maxon sensor

for motor type A:
442_ENX 22 EASY INT
for motor type B:
442_ENX 22 EASY INT Abs.

maxon motor control

487_ESCON Module 50/4 EC-S
487_ESCON Module 50/5
488_ESCON Module 50/8 HE
489_ESCON 50/5
489_ESCON 70/10
491_DEC Module 50/5
496_EPOS4 Mod./Comp. 50/5
497_EPOS4 Mod./Comp. 50/8
501_EPOS4 70/15
501_EPOS4 50/5
504_EPOS2 P 24/5

Configuration

Flange front: thread holes/center thread
Flange back: plastic ring/external thread/with opening
Shaft front: length/diameter
Shaft rear: length
Electric connection: cable length/pin connection/connector
Temperature Sensor: NTC-Thermistor
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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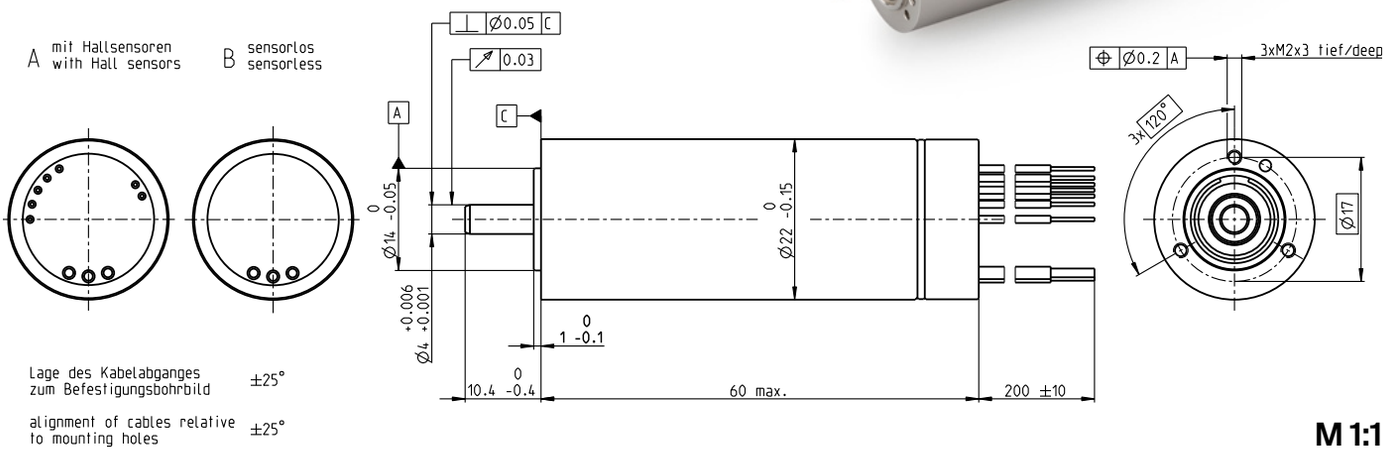
ECX SPEED 22 L brushless
BLDC motor ∅22 mm

Sterilizable

Key Data: 120/162 W, 28.3 mNm, 60 000 rpm



M 1:1

	Motor Data				
1_	Nominal voltage	V	24	36	48
2_	No load speed	rpm	54100	56200	57300
3_	No load current	mA	425	303	235
4_	Nominal speed	rpm	52100	54400	55500
5_	Nominal torque (max. continuous torque)	mNm	27.7	28.3	26.6
6_	Nominal current (max. continuous current)	A	6.92	4.89	3.54
7_	Stall torque	mNm	965	1160	1120
8_	Stall current	A	228	190	140
9_	Max. efficiency	%	91.7	92.3	92.1
10_	Terminal resistance	Ω	0.105	0.189	0.343
11_	Terminal inductance	mH	0.0114	0.0237	0.0406
12_	Torque constant	mNm/A	4.23	6.11	7.99
13_	Speed constant	rpm/V	2260	1560	1200
14_	Speed/torque gradient	rpm/mNm	56.1	48.4	51.3
15_	Mechanical time constant	ms	1.39	1.2	1.27
16_	Rotor inertia	gcm²	2.36	2.36	2.36

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	12.5
18_	Thermal resistance winding-housing	K/W	0.84
19_	Thermal time constant winding	s	2.96
20_	Thermal time constant motor	s	634
21_	Ambient temperature	°C	-40...+135
22_	Max. winding temperature	°C	155
	Mechanical data ball bearings		
23_	Max. speed	rpm	60 000
24_	Axial play	mm	0...0.24
	Preload	N	4
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	4
27_	Max. force for press fits (static)	N	110
	(static, shaft supported)	N	6000
28_	Max. radial load [mm from flange]	N	16 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	148
32_	Typical noise level [rpm]	dBA	55 [50 000]

Connection A and B, motor (Cable AWG 18)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors (Cable AWG 26)

orange	V_{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 47. In combination with the ENX EASY INT, the orange (V_{cc}) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

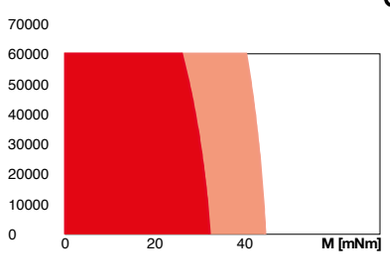
Connection NTC (Cable AWG 26)

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm ±1%, beta (25–85°C): 3490 K

Operating Range

n [rpm] winding 36 V



135°C SSS

Sterilization information

Sterilization cycles
Sensorless: typical 2000
Hall sensors: typical 1000

Sterilization with steam

Temperature	+134°C ±4°C
Compression pressure up to	2.3 bar
Rel. humidity	100%
Cycle length	18 min.

- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Short term operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
343_GPX 22 SPEED	1–2	for motor type A: 442_ENX 22 EASY INT for motor type B: 442_ENX 22 EASY INT Abs.	487_ESCON Module 50/4 EC-S 487_ESCON Module 50/5 488_ESCON Module 50/8 HE 489_ESCON 50/5 489_ESCON 70/10 491_DEC Module 50/5 496_EPOS4 Mod./Comp. 50/5 497_EPOS4 Mod./Comp. 50/8 501_EPOS4 50/5 501_EPOS4 70/15 504_EPOS2 P 24/5

Configuration

Flange front: thread holes/center thread
Flange back: plastic ring/external thread/with opening
Shaft front: length/diameter
Electric connection: cable length/pin connection
Temperature Sensor: NTC-Thermistor
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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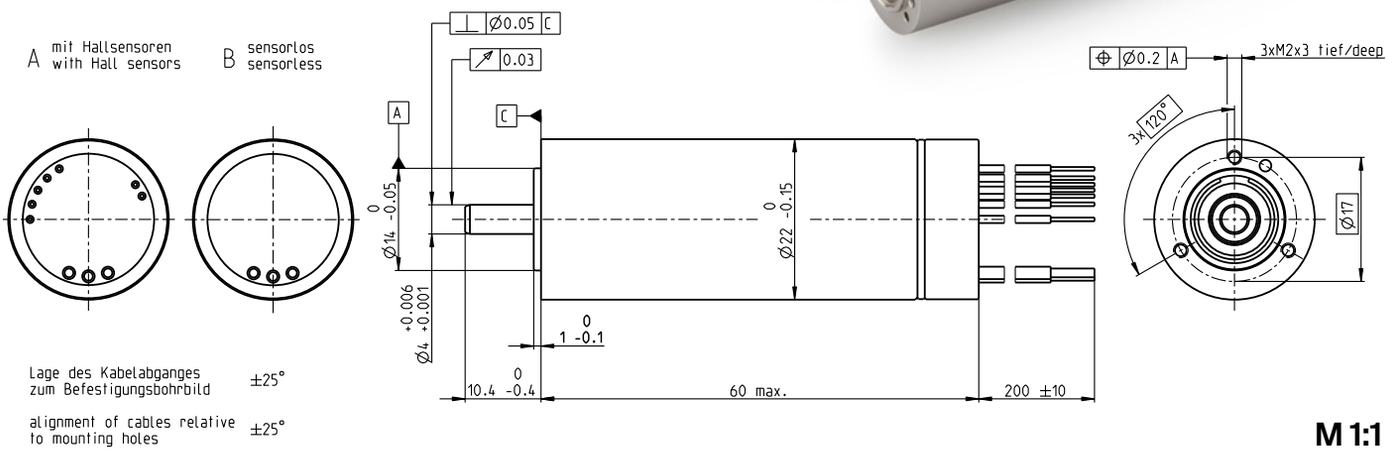
ECX SPEED 22 L brushless
BLDC motor ∅22 mm

Sterilizable, Ceramic Bearings

Key Data: 120/169 W, 27.1 mNm, 85 000 rpm



M 1:1

	Motor Data				
1_	Nominal voltage	V	24	36	48
2_	No load speed	rpm	54100	56200	57300
3_	No load current	mA	477	339	263
4_	Nominal speed	rpm	52200	54400	55500
5_	Nominal torque (max. continuous torque)	mNm	26.7	27.1	25.5
6_	Nominal current (max. continuous current)	A	6.72	4.74	3.42
7_	Stall torque	mNm	965	1160	1120
8_	Stall current	A	228	190	140
9_	Max. efficiency	%	91.2	91.8	91.6
10_	Terminal resistance	Ω	0.105	0.189	0.343
11_	Terminal inductance	mH	0.0114	0.0237	0.0406
12_	Torque constant	mNm/A	4.23	6.11	7.99
13_	Speed constant	rpm/V	2260	1560	1200
14_	Speed/torque gradient	rpm/mNm	56.1	48.4	51.3
15_	Mechanical time constant	ms	1.39	1.2	1.27
16_	Rotor inertia	gcm²	2.36	2.36	2.36

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	12.5
18_	Thermal resistance winding-housing	K/W	0.84
19_	Thermal time constant winding	s	2.96
20_	Thermal time constant motor	s	634
21_	Ambient temperature	°C	-40...+135
22_	Max. winding temperature	°C	155
	Mechanical data ball bearings		
23_	Max. speed	rpm	85 000
24_	Axial play	mm	0...0.24
	Preload	N	4
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	4
27_	Max. force for press fits (static)	N	110
	(static, shaft supported)	N	6000
28_	Max. radial load [mm from flange]	N	16 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	148
32_	Typical noise level [rpm]	dBA	55 [50 000]

Connection A and B, motor (Cable AWG 18)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors (Cable AWG 26)

orange	V_{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 47. In combination with the ENX EASY INT, the orange (V_{cc}) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

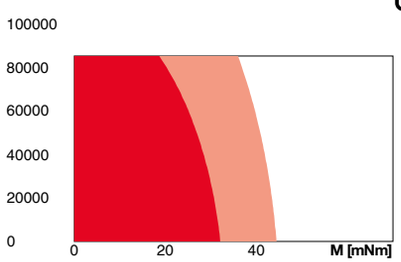
Connection NTC (Cable AWG 26)

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm ±1%, beta (25–85°C): 3490 K

Operating Range

n [rpm] winding 36 V



Sterilization information

135°C SSS

Sterilization cycles
Sensorless: typical 2000
Hall sensors: typical 1000

Sterilization with steam

Temperature	+134°C ±4°C
Compression pressure up to	2.3 bar
Rel. humidity	100%
Cycle length	18 min.

- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Short term operation

maxon Modular System

Details on catalog page 32

maxon gear Stages [opt.]
343_GPX 22 SPEED 1–2

maxon sensor
for motor type A:
442_ENX 22 EASY INT
for motor type B:
442_ENX 22 EASY INT Abs.

maxon motor control
487_ESCON Module 50/4 EC-S
487_ESCON Module 50/5
488_ESCON Module 50/8 HE
489_ESCON 50/5
489_ESCON 70/10
491_DEC Module 50/5
496_EPOS4 Mod./Comp. 50/5
497_EPOS4 Mod./Comp. 50/8
501_EPOS4 50/5
501_EPOS4 70/15
504_EPOS2 P 24/5

Configuration

Flange front: thread holes/center thread
Flange back: plastic ring/external thread/with opening
Shaft front: length/diameter
Electric connection: cable length/pin connection
Temperature Sensor: NTC-Thermistor
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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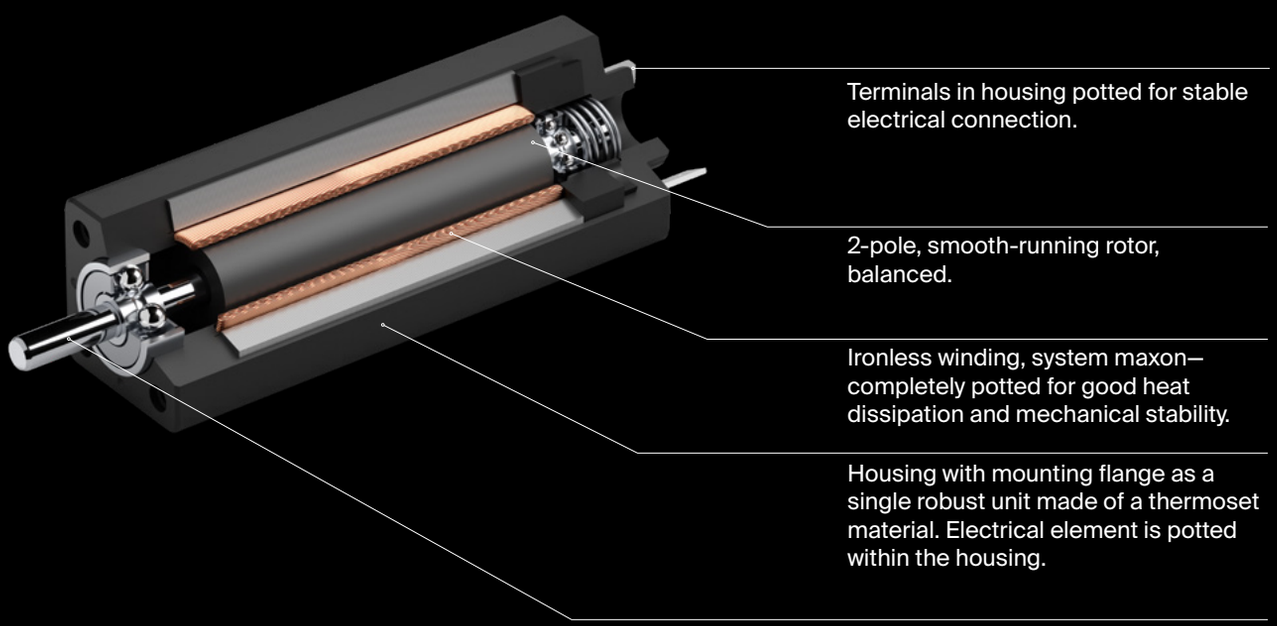
maxon ECX SQUARE

maxon ECX SQUARE

The brushless ECX SQUARE motors stand out for their cost-optimized design and are perfect for large batch numbers. The plastic housing and the winding inside are potted in a single operation. The resulting motors are robust, compact, and have a long service life. ECX motors can be configured online and are ready for shipping in 11 working days.

Key data

Motor □	16 mm
Motor length	52 mm
Power	20 W
Nominal torque	up to 13 mNm
Max. permissible speed	up to 30,000 rpm



- → Compact, one-piece housing made of a thermoset material
- → Attractive price-performance ratio
- → Speeds up to 30 000 rpm
- → Easily configured online

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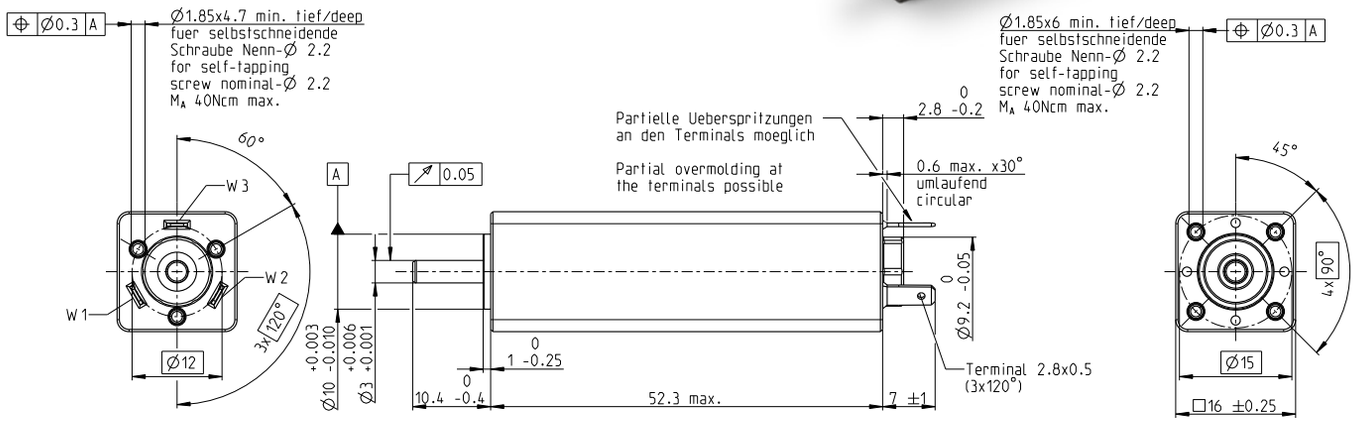
ECX SQUARE 16 L brushless
BLDC motor ☐16 mm

Sensorless

Key Data: 20/36 W, 12.9 mNm, 30 000 rpm



M 1:1

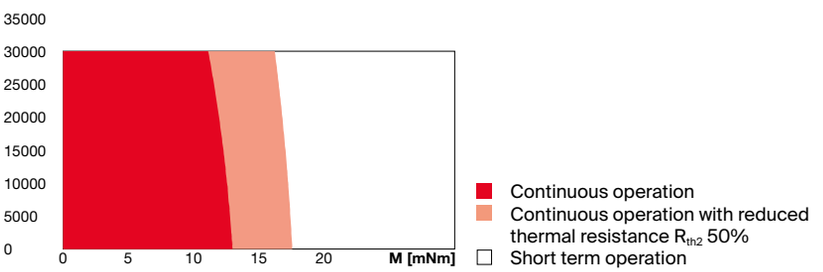
	Motor Data					
1_	Nominal voltage	V	6	9	12	18
2_	No load speed	rpm	17600	18700	17600	20300
3_	No load current	mA	288	234	141	139
4_	Nominal speed	rpm	14300	15300	14400	17100
5_	Nominal torque (max. continuous torque)	mNm	13.1	12	13.1	12.3
6_	Nominal current (max. continuous current)	A	4.3	2.84	2.15	1.59
7_	Stall torque	mNm	74.6	69.5	74.3	81.8
8_	Stall current	A	23.2	15.4	11.6	9.83
9_	Max. efficiency	%	79.4	77.4	79.6	78.3
10_	Terminal resistance	Ω	0.259	0.585	1.04	1.83
11_	Terminal inductance	mH	0.018	0.0357	0.0698	0.12
12_	Torque constant	mNm/A	3.22	4.52	6.41	8.32
13_	Speed constant	rpm/V	2970	2110	1490	1150
14_	Speed/torque gradient	rpm/mNm	238	273	241	253
15_	Mechanical time constant	ms	2.52	2.89	2.55	2.67
16_	Rotor inertia	gcm²	1.01	1.01	1.01	1.01

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	12
18_	Thermal resistance winding-housing	K/W	1.68
19_	Thermal time constant winding	s	3.11
20_	Thermal time constant motor	s	390
21_	Ambient temperature[1]	°C	-20...+100
22_	Max. winding temperature	°C	125
	Mechanical data ball bearings		
23_	Max. speed	rpm	30 000
24_	Axial play	mm	0...0.14
	Preload	N	1
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	0.8
27_	Max. force for press fits (static)	N	40
	(static, shaft supported)	N	1000
28_	Max. radial load [mm from flange]	N	6 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	65
32_	Typical noise level [rpm]	dBA	46 [16 000]

Connection
W1: Motor winding 1
W2: Motor winding 2
W3: Motor winding 3

Operating Range

n [rpm] Winding 12 V



maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
331_GPX 16 A/C	1–2 [3–4]		487_ESCON Module 50/4 EC-S
332_GPX 16 LN/LZ	1–2 [3–4]		
333_GPX 16 HP	2–3 [4]		
335_GPX 19 A/C	3-4		
336_GPX 19 LN/LZ	3-4		
337_GPX 19 HP	4		

Configuration	Notes
Shaft front: length/diameter	

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For your personal notes

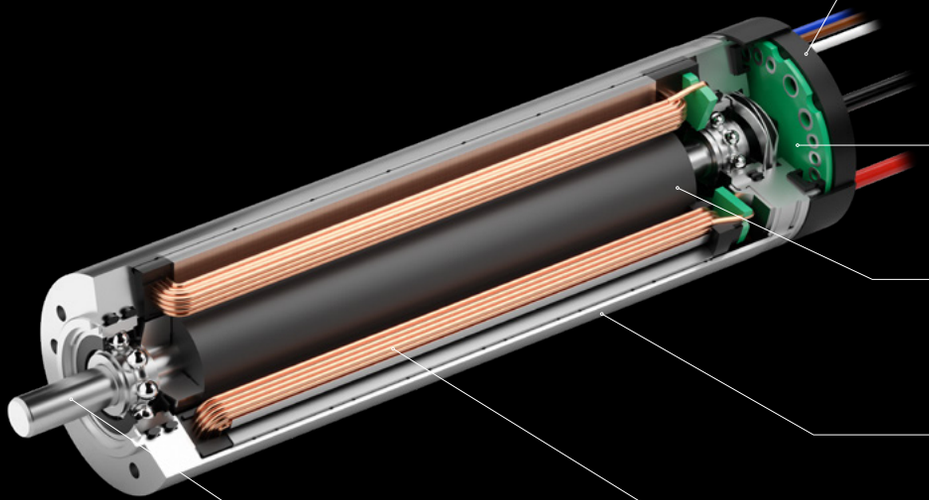
maxon ECX TORQUE

maxon ECX TORQUE

High torque density and unrivaled dynamics: The iron core winding and multi-pole rotor design of the brushless ECX TORQUE motors allow them to achieve a high torque density. The robust design and high build quality provide a long service life. ECX motors can be configured online and are ready for shipping in 11 working days.

Key data

Motor ∅	22 mm
Motor length	43 ... 82 mm
Power	30 ... 40 W
Nominal torque	up to 80 mNm
Max. permissible speed	up to 16 000 rpm



Electrical connection with single wires or as pluggable pin solution. Both versions are completely potted, for strain relief and to protect the motor against dirt.

Variety of sensor options can be integrated: temperature sensor, hall elements, encoder.

Multi-pole internal rotor with top-quality magnets for maximum torque.

Motor housing includes a mounting flange as a single part, stainless steel and non-magnetic.

Stator with iron core winding. High fill factor for max efficiency. Potted winding system for optimal heat dissipation and mechanical stability.

Stainless steel shaft with high stiffness – various modification options available.

- → High torque density
- → Multi-pole internal-rotor motor with iron core winding
- → Mechanical time constants below one millisecond
- → Robust and durable design
- → Easily configured online

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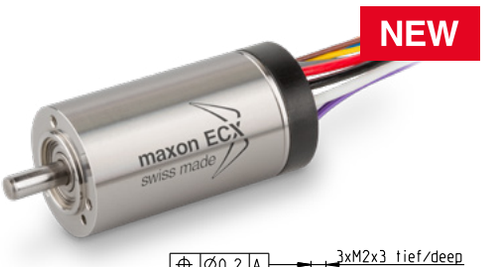
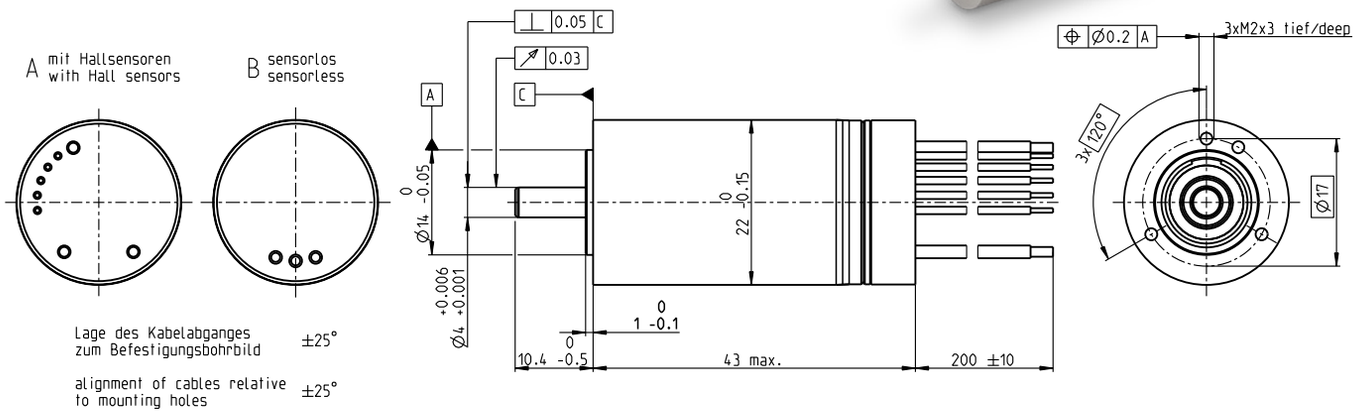
ECX TORQUE 22 M brushless
BLDC motor ∅22 mm

NEW



ECX TORQUE

Key Data: 30/43 W, 32.4 mNm, 16 000 rpm



M 1:1

	Motor Data					
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	14300	15300	15100	13000
3_	No load current	mA	175	145	94.8	56.5
4_	Nominal speed	rpm	12200	13100	12900	10900
5_	Nominal torque (max. continuous torque)	mNm	29.4	28.6	29.7	32.4
6_	Nominal current (max. continuous current)	A	2.41	1.88	1.28	0.885
7_	Stall torque	mNm	439	466	494	461
8_	Stall current	A	37.1	31.5	21.9	13.2
9_	Max. efficiency	%	86.9	87.1	87.4	87.5
10_	Terminal resistance	Ω	0.486	0.763	1.64	3.63
11_	Terminal inductance	mH	0.274	0.428	0.988	2.38
12_	Torque constant	mNm/A	11.8	14.8	22.5	34.9
13_	Speed constant	rpm/V	806	645	424	273
14_	Speed/torque gradient	rpm/mNm	33.1	33.2	31	28.4
15_	Mechanical time constant	ms	0.596	0.599	0.558	0.512
16_	Rotor inertia	gcm²	1.72	1.72	1.72	1.72

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	15.7
18_	Thermal resistance winding-housing	K/W	4.48
19_	Thermal time constant winding	s	18.4
20_	Thermal time constant motor	s	644
21_	Ambient temperature	°C	-40...+100
22_	Max. winding temperature	°C	155

	Mechanical data ball bearings		
23_	Max. speed	rpm	16 000
24_	Axial play	mm	0...0.24
	Preload	N	4.0
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	4.0
27_	Max. force for press fits (static)	N	110
	(static, shaft supported)	N	
28_	Max. radial load [mm from flange]	N	22 [5]

	Other specifications		
29_	Number of pole pairs		4
30_	Number of phases		3
31_	Weight of motor	g	82.1
32_	Typical noise level [rpm]	dBA	54 [12 000]

Connection A and B, motor (Cable AWG 18)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors (Cable AWG 26)

orange	V_{CC} 5 ±0.5 V
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Output signals: CMOS compatible push-pull stage. No pull-up resistor required. Hall signals are generated by an EASY INT sensor. In combination with the ENX EASY INT, the orange (V_{CC}) and blue (GND) connections are not used.

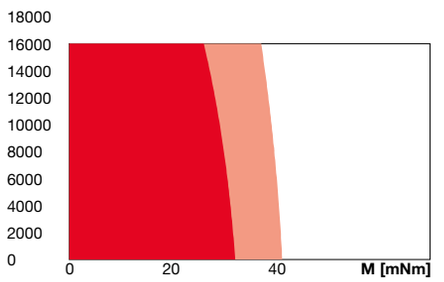
Connection Temperature sensor (Cable AWG 26)

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm +-1%, beta (25-85°C): 3490 K

Operating Range

n [rpm] winding 24 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Short term operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
339_GPX 22 A/C	1–2	for motor type A:	486_ESCON Module 24/2
340_GPX 22 LN/LZ	1–2	442_ENX 22 EASY INT	487_ESCON 36/3 EC
341_GPX 22 HP	2–3	for motor type B:	487_ESCON Module 50/4 EC-S
342_GPX 22 UP	1–4	442_ENX 22 EASY INT Abs.	487_ESCON Module 50/5
344_GPX 26 A/C	3		489_ESCON 50/5
345_GPX 26 LN/LZ	3		491_DEC Module 24/2 , 50/5
346_GPX 26 HP	4		495_EPOS4 Micro 24/5
			496_EPOS4 Module/Comp. 50/5
			504_EPOS2 P 24/5

Configuration

Flange front: thread holes/center thread
Flange back: plastic ring/center thread
Shaft front: length/diameter
Electric connection: cable length/pin connection/connector
Temperature sensor: without/NTC-Thermistor

Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog Accessories section.

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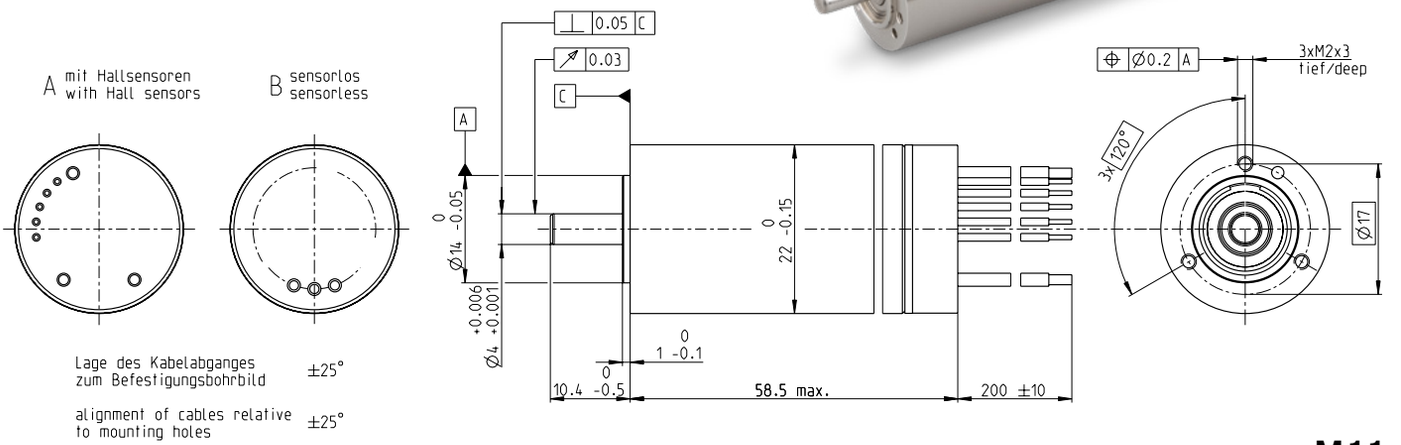
ECX TORQUE 22 L brushless
BLDC motor ∅22 mm

NEW

Key Data: 35/48 W, 48.8 mNm, 11000 rpm



M 1:1

	Motor Data				
1_	Nominal voltage	V	12	24	48
2_	No load speed	rpm	9380	10300	10900
3_	No load current	mA	224	129	69.9
4_	Nominal speed	rpm	7930	8850	9380
5_	Nominal torque (max. continuous torque)	mNm	45.7	48.1	48.8
6_	Nominal current (max. continuous current)	A	3.7	2.13	1.14
7_	Stall torque	mNm	528	684	766
8_	Stall current	A	43.6	31.1	18.3
9_	Max. efficiency	%	86.4	87.7	88.2
10_	Terminal resistance	Ω	0.275	0.771	2.62
11_	Terminal inductance	mH	0.148	0.49	1.77
12_	Torque constant	mNm/A	12.1	22	41.8
13_	Speed constant	rpm/V	789	434	228
14_	Speed/torque gradient	rpm/mNm	17.9	15.2	14.3
15_	Mechanical time constant	ms	0.575	0.488	0.459
16_	Rotor inertia	gcm²	3.06	3.06	3.06

	Thermal data		
17_	Thermal resistance housing-ambient	K/W	13.4
18_	Thermal resistance winding-housing	K/W	3.8
19_	Thermal time constant winding	s	25
20_	Thermal time constant motor	s	757
21_	Ambient temperature	°C	-40...+100
22_	Max. winding temperature	°C	155

	Mechanical data ball bearings		
23_	Max. speed	rpm	11000
24_	Axial play	mm	0...0.24
	Preload	N	4.0
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	4.0
27_	Max. force for press fits (static)	N	110
	(static, shaft supported)	N	
28_	Max. radial load [mm from flange]	N	29 [5]

	Other specifications		
29_	Number of pole pairs		4
30_	Number of phases		3
31_	Weight of motor	g	113
32_	Typical noise level [rpm]	dBA	56 [9000]

Connection A and B, motor (Cable AWG 18)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors (Cable AWG 26)

orange	V_{CC} 5 ±0.5 V
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

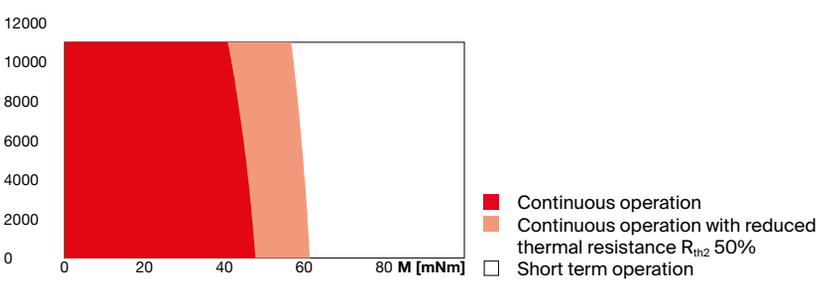
Output signals: CMOS compatible push-pull stage. No pull-up resistor required. Hall signals are generated by an EASY INT sensor. In combination with the ENX EASY INT, the orange (V_{CC}) and blue (GND) connections are not used.

Connection Temperature sensor (Cable AWG 26)

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm +-1%, beta (25-85°C): 3490 K

Operating Range



maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
339_GPX 22 A/C	1–2	for motor type A:	486_ESCON Module 24/2
340_GPX 22 LN/LZ	1–2	442_ENX 22 EASY INT	487_ESCON 36/3 EC
341_GPX 22 HP	2–3	for motor type B:	487_ESCON Module 50/4 EC-S
342_GPX 22 UP	1–4	442_ENX 22 EASY INT Abs.	487_ESCON Module 50/5
344_GPX 26 A/C	3		489_ESCON 50/5
345_GPX 26 LN/LZ	3		491_DEC Module 24/2 , 50/5
346_GPX 26 HP	4		495_EPOS4 Micro 24/5
			496_EPOS4 Module/Comp. 50/5
			504_EPOS2 P 24/5

Configuration

Flange front: thread holes/center thread
Flange back: plastic ring/center thread
Shaft front: length/diameter
Electric connection: cable length/pin connection/connector
Temperature sensor: without/NTC-Thermistor

Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog Accessories section.

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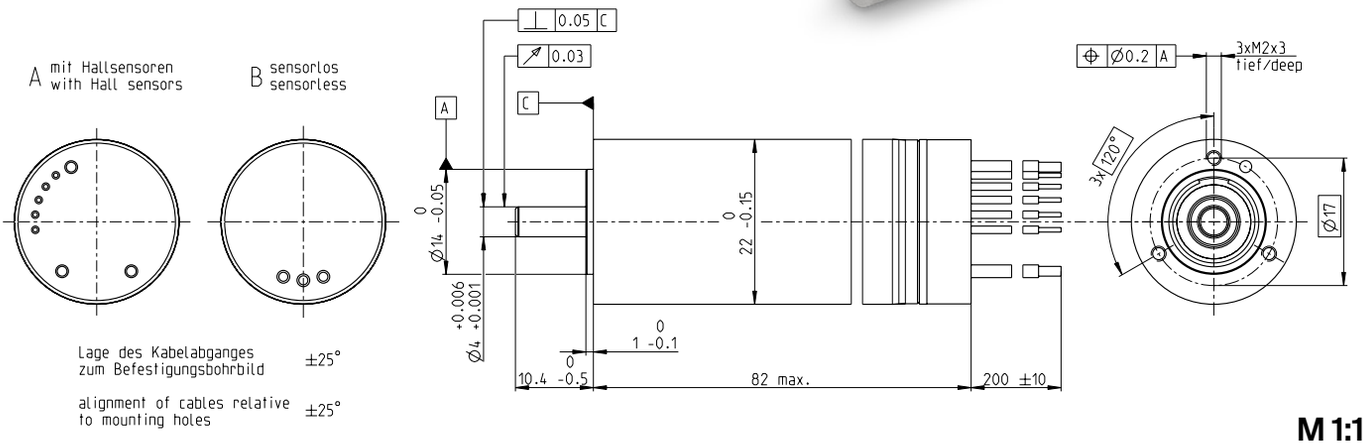
ECX TORQUE 22 XL brushless
BLDC motor ∅22 mm

NEW

ECX TORQUE

Key Data: 40/55 W, 79.9 mNm, 8000 rpm



M 1:1

	Motor Data			
1_	Nominal voltage	V	24	48
2_	No load speed	rpm	6030	6350
3_	No load current	mA	96.8	52
4_	Nominal speed	rpm	5000	5320
5_	Nominal torque (max. continuous torque)	mNm	77.5	79.9
6_	Nominal current (max. continuous current)	A	2.01	1.09
7_	Stall torque	mNm	730	832
8_	Stall current	A	19.4	11.6
9_	Max. efficiency	%	86.5	87.2
10_	Terminal resistance	Ω	1.24	4.13
11_	Terminal inductance	mH	0.798	2.88
12_	Torque constant	mNm/A	37.7	71.6
13_	Speed constant	rpm/V	253	133
14_	Speed/torque gradient	rpm/mNm	8.33	7.7
15_	Mechanical time constant	ms	0.434	0.401
16_	Rotor inertia	gcm²	4.97	4.97
	Thermal data			
17_	Thermal resistance housing-ambient	K/W	10.9	
18_	Thermal resistance winding-housing	K/W	2.46	
19_	Thermal time constant winding	s	26.1	
20_	Thermal time constant motor	s	883	
21_	Ambient temperature	°C	-40...+100	
22_	Max. winding temperature	°C	155	
	Mechanical data ball bearings			
23_	Max. speed	rpm	8000	
24_	Axial play	mm	0...0.24	
	Preload	N	4.0	
	Direction of force		pull	
25_	Radial play		preloaded	
26_	Max. axial load (dynamic)	N	4.0	
27_	Max. force for press fits (static)	N	110	
	(static, shaft supported)	N		
28_	Max. radial load [mm from flange]	N	33 [5]	
	Other specifications			
29_	Number of pole pairs		4	
30_	Number of phases		3	
31_	Weight of motor	g	162	
32_	Typical noise level [rpm]	dBA	60 [5000]	

Connection A and B, motor (Cable AWG 18)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors (Cable AWG 26)

orange	V_{CC} 5 ±0.5 V
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Output signals: CMOS compatible push-pull stage. No pull-up resistor required. Hall signals are generated by an EASY INT sensor. In combination with the ENX EASY INT, the orange (V_{CC}) and blue (GND) connections are not used.

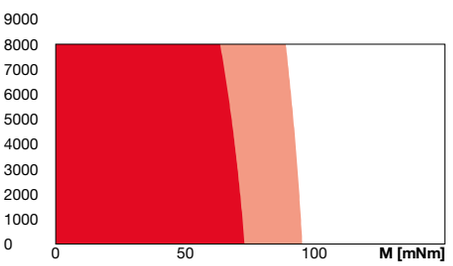
Connection Temperature sensor (Cable AWG 26)

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm +-1%, beta (25-85°C): 3490 K

Operating Range

n [rpm] winding 24 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Short term operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]
339_GPX 22 A/C	1–2
340_GPX 22 LN/LZ	1–2
341_GPX 22 HP	2–3
342_GPX 22 UP	1–4
344_GPX 26 A/C	3
345_GPX 26 LN/LZ	3
346_GPX 26 HP	4

maxon sensor
for motor type A:
442_ENX 22 EASY INT
for motor type B:
442_ENX 22 EASY INT Abs.

maxon motor control
486_ESCON Module 24/2
487_ESCON 36/3 EC
487_ESCON Module 50/4 EC-S
487_ESCON Module 50/5
489_ESCON 50/5
491_DEC Module 24/2 , 50/5
495_EPOS4 Micro 24/5
496_EPOS4 Module/Comp. 50/5
504_EPOS2 P 24/5

Configuration

Flange front: thread holes/center thread
Flange back: plastic ring/center thread
Shaft front: length/diameter
Electric connection: cable length/pin connection/connector
Temperature sensor: without/NTC-Thermistor

Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog Accessories section.

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For your personal notes

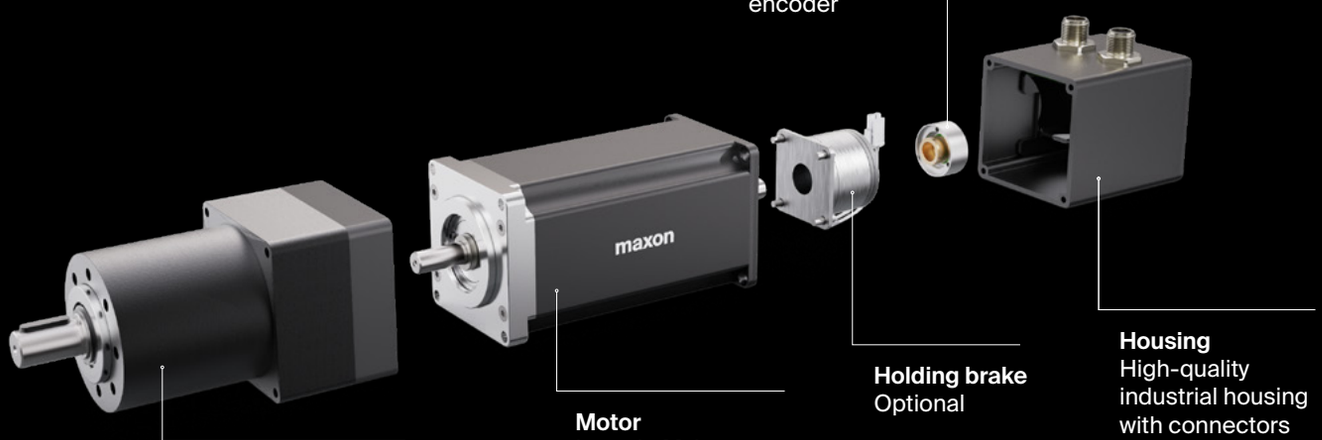
maxon IDX

maxon IDX

The compact brushless EC-i motor combined with a high-quality sensor in robust industrial housing is ideally suited to demanding speed and positioning tasks. This motor is also available as a drive with integrated positioning and speed controller.

Key data

Drive ☐	56 mm
Drive length	127 ... 177 mm
Power	350 ... 500 W
Rated torque	up to 1110 mNm
Drive speed	up to 8000 rpm



Encoder
Integrated absolute encoder

Gearheads
Stages: 1–3
Variants: Standard, reduced noise level, ultra performance

Motor
Length: M, L
Winding: 24 V, 48 V
Flange: A flange, C flange

Holding brake
Optional

Housing
High-quality industrial housing with connectors and IP65 protection class

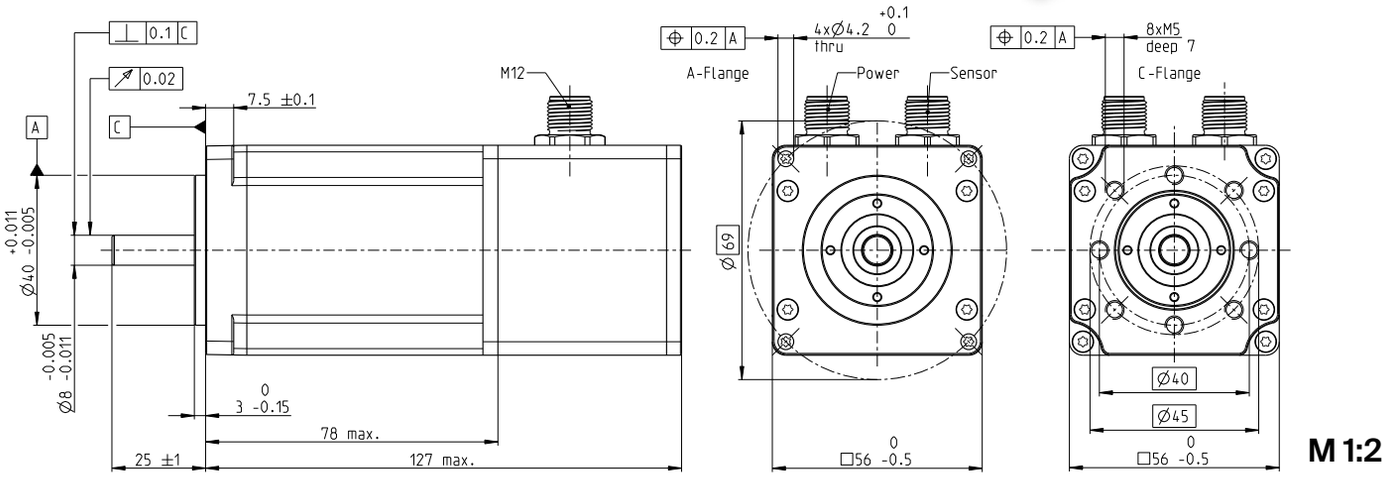
- → High continuous torque
- → High power density
- → IP65-protected design
- → Easily configured online

IDX 56 M brushless
BLDC motor ☐56 mm

NEW

IDX

Key Data: 350/420 W, 693 mNm, 8000 rpm

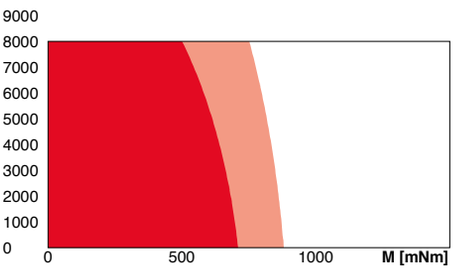


M 1:2

	Motor Data			
1_	Nominal voltage	V	24	48
2_	No load speed	rpm	5740	7270
3_	No load current	mA	911	653
4_	Nominal speed	rpm	4820	6260
5_	Nominal torque (max. continuous torque)	mNm	693	622
6_	Nominal current (max. continuous current)	A	16.1	9.35
7_	Stall torque	mNm	15800	20500
8_	Stall current	A	399	328
9_	Max. efficiency	%	90.8	91.3
10_	Terminal resistance	Ω	0.0601	0.146
11_	Terminal inductance	mH	0.0941	0.234
12_	Torque constant	mNm/A	39.5	62.4
13_	Speed constant	rpm/V	242	153
14_	Speed/torque gradient	rpm/mNm	0.367	0.359
15_	Mechanical time constant	ms	0.654	0.639
16_	Rotor inertia	gcm²	170	170
	Thermal data			
17_	Thermal resistance housing-ambient	K/W	2.36	
18_	Thermal resistance winding-housing	K/W	1.05	
19_	Thermal time constant winding	s	17.1	
20_	Thermal time constant motor	s	962	
21_	Ambient temperature	°C	-40...+100	
22_	Max. winding temperature	°C	155	
	Mechanical data ball bearings			
23_	Max. speed	rpm	8000	
24_	Axial play	mm	0...0.14	
	Preload	N	15	
	Direction of force		pull	
25_	Radial play		preloaded	
26_	Max. axial load (dynamic)	N	12	
27_	Max. force for press fits (static)	N	150	
	(static, shaft supported)	N		
28_	Max. radial load [mm from flange]	N	110 [12.5]	
	Other specifications			
29_	Number of pole pairs		8	
30_	Number of phases		3	
31_	Weight of motor	g	815	
32_	Typical noise level [rpm]	dBA	54 [4000]	

Operating Range

n [rpm] winding 48 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Short term operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
354-355_GPX 52 A/UP/LN	1–3	integrated	488_ESCON Module 50/8
			488_ESCON Module 50/8 HE
		maxon brake	489_ESCON 70/10
		522_AB 34	497_EPOS4 Mod./Comp. 50/15
			501_EPOS4 70/15

Power Connection (M12, male, 5 poles, L-coded)

Pin 1	Motor winding 1
Pin 2	Motor winding 2
Pin 3	Motor winding 3
Pin 4	U_{brake} +24 VDC (optional)
Pin 5	U_{brake} GND (optional)

Sensor Connection (M12, male, 17 poles, A-coded)

Pin 1	GND	Pin 10	B
Pin 2	NTC	Pin 11	DATA/
Pin 3	V_{CC} 4.75...26 V	Pin 12	DATA
Pin 4	A	Pin 13	CLK
Pin 5	I/	Pin 14	CLK/
Pin 6	A/	Pin 15	Hall Sensor 3
Pin 7	B/	Pin 16	Hall Sensor 1
Pin 8	I	Pin 17	Hall Sensor 2
Pin 9	NTC		

NTC resistor 25°C: 10 kOhm ±1%, beta (25–100°C): 3460 K

Wiring diagram for Hall sensors see p. 49

Configuration

Flange front: A-Flange/C-Flange
Encoder Interface: SSI/BiSS-C

Notes about the encoder

Output level incremental, RS422, with internal supply voltage 5 V
Input/output level absolute, RS422, with internal supply voltage 5 V
Resolution (not configurable) 1024 cpt / 4096 steps (12 bit)
More production information can be found online, under ENX 22 EASY INT

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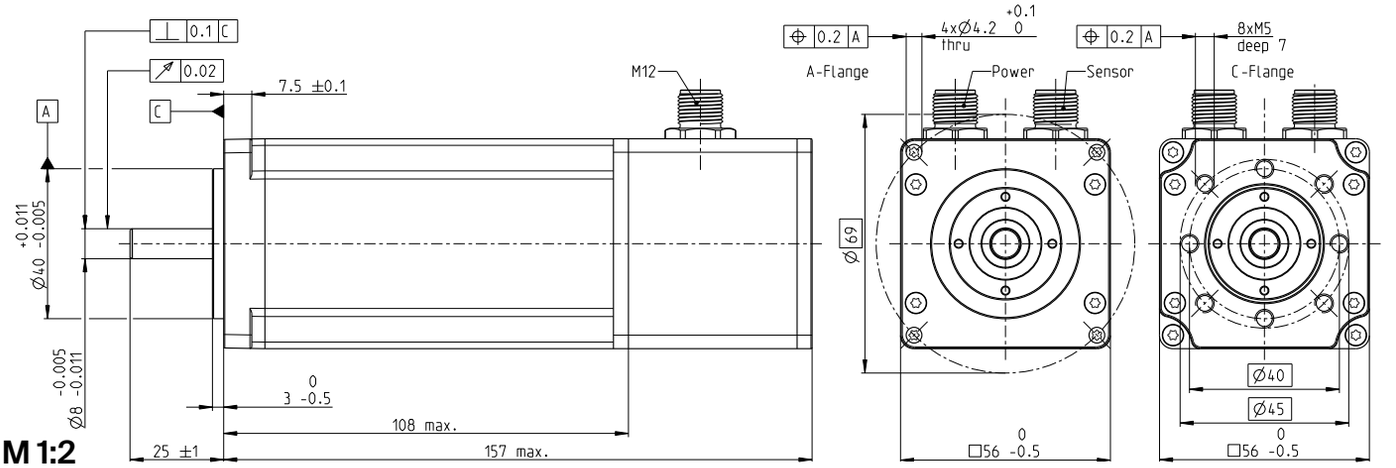
IDX 56 L brushless
BLDC motor ☐56 mm

NEW

IDX

Key Data: 400/500 W, 1110 mNm, 6000 rpm



M 1:2

	Motor Data			
1_	Nominal voltage	V	24	48
2_	No load speed	rpm	3440	5440
3_	No load current	mA	693	673
4_	Nominal speed	rpm	2860	4740
5_	Nominal torque (max. continuous torque)	mNm	1110	979
6_	Nominal current (max. continuous current)	A	15.6	11.1
7_	Stall torque	mNm	16700	27100
8_	Stall current	A	252	324
9_	Max. efficiency	%	89.9	91.2
10_	Terminal resistance	Ω	0.0952	0.148
11_	Terminal inductance	mH	0.138	0.221
12_	Torque constant	mNm/A	66.2	83.6
13_	Speed constant	rpm/V	144	114
14_	Speed/torque gradient	rpm/mNm	0.208	0.202
15_	Mechanical time constant	ms	0.576	0.561
16_	Rotor inertia	gcm²	265	265
	Thermal data			
17_	Thermal resistance housing-ambient	K/W	1.94	
18_	Thermal resistance winding-housing	K/W	0.67	
19_	Thermal time constant winding	s	17.7	
20_	Thermal time constant motor	s	1160	
21_	Ambient temperature	°C	-40...+100	
22_	Max. winding temperature	°C	155	
	Mechanical data ball bearings			
23_	Max. speed	rpm	6000	
24_	Axial play	mm	0...0.14	
	Preload	N	15	
	Direction of force		pull	
25_	Radial play		preloaded	
26_	Max. axial load (dynamic)	N	12	
27_	Max. force for press fits (static)	N	150	
	(static, shaft supported)	N		
28_	Max. radial load [mm from flange]	N	110 [12.5]	
	Other specifications			
29_	Number of pole pairs		8	
30_	Number of phases		3	
31_	Weight of motor	g	1196	
32_	Typical noise level [rpm]	dBA	58 [4000]	

Power Connection (M12, male, 5 poles, L-coded)

Pin 1	Motor winding 1
Pin 2	Motor winding 2
Pin 3	Motor winding 3
Pin 4	U_{brake} +24 VDC (optional)
Pin 5	U_{brake} GND (optional)

Sensor Connection (M12, male, 17 poles, A-coded)

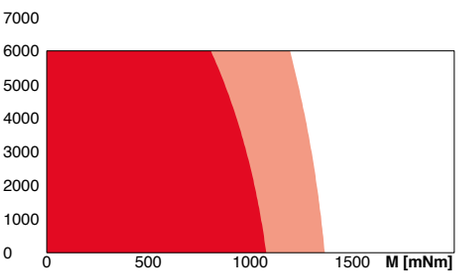
Pin 1	GND	Pin 10	B
Pin 2	NTC	Pin 11	DATA/
Pin 3	V_{CC} 4.75...26 V	Pin 12	DATA
Pin 4	A	Pin 13	CLK
Pin 5	I/	Pin 14	CLK/
Pin 6	A/	Pin 15	Hall Sensor 3
Pin 7	B/	Pin 16	Hall Sensor 1
Pin 8	I	Pin 17	Hall Sensor 2
Pin 9	NTC		

NTC resistor 25°C: 10 kOhm ±1%, beta (25–100°C): 3460 K

Wiring diagram for Hall sensors see p. 49

Operating Range

n [rpm] winding 48 V



- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Short term operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
354-355_GPX 52 A/UP/LN	1–3	integrated	488_ESCON Module 50/8
			488_ESCON Module 50/8 HE
		maxon brake	489_ESCON 70/10
		522_AB 34	497_EPOS4 Mod./Comp. 50/15
			501_EPOS4 70/15

Configuration

Flange front: A-Flange/C-Flange
Encoder Interface: SSI/BiSS-C

Notes about the encoder

Output level incremental, RS422, with internal supply voltage 5 V
Input/output level absolute, RS422, with internal supply voltage 5 V
Resolution (not configurable) 1024 cpt / 4096 steps (12 bit)
More production information can be found online, under ENX 22 EASY INT

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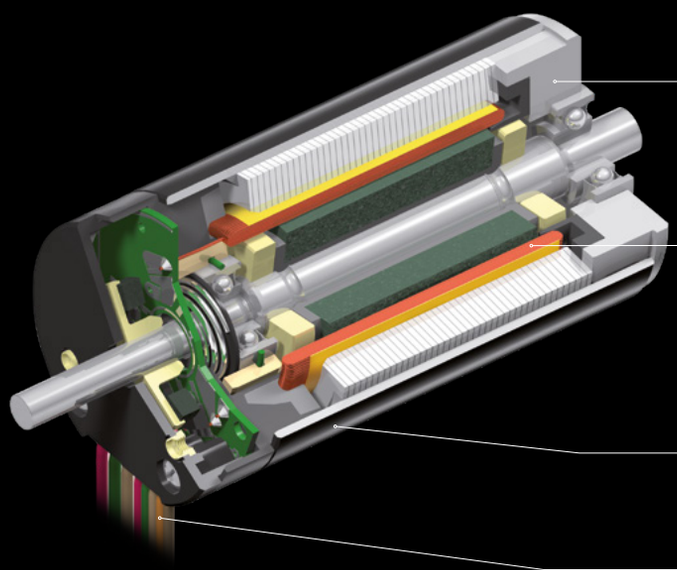
maxon EC

maxon EC

The electrically commutated maxon EC motors are longer-lasting than their counterparts in the DC range. The long life span offered by the brushless design is due to the use of preloaded ball bearings. The EC motors have excellent torque characteristics, high power, and a wide speed range. The outstanding controllability of the motors enables high-precision positioning tasks.

Key data

Motor ∅	10 ... 60 mm
Motor length	26 ... 180 mm
Power	0.5 ... 400 W
Nominal torque	up to 800 mNm
Max. permissible speed	up to 65 000 rpm



Metal housing and flange ensure good heat dissipation and mechanical stability.

"The centerpiece" is the ironless maxon winding. Its physical design offer benefits such as a zero cogging torque, high efficiency and excellent control dynamics.

The motor housing is a steel tube – non-magnetic, rigid, coated.

Strain-relieved cables; dust-protected depending on the size, with or without connector.

- → Designed for long uptime
- → Performance optimized at high speeds of up to 65 000 rpm
- → Robust design
- → From diameter 45 mm with dust and splash protection
- → "Heavy Duty" version for extreme environmental conditions

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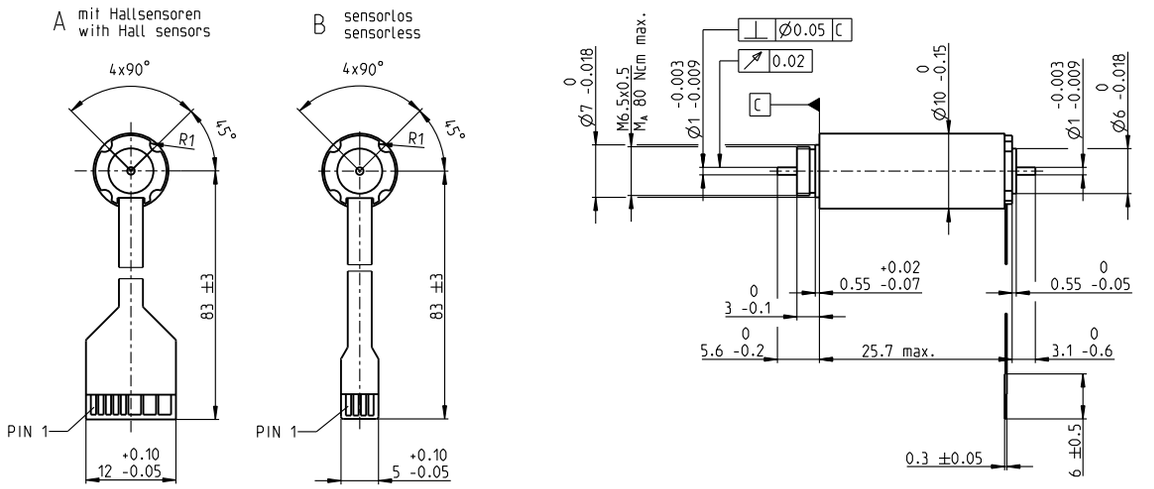
EC 10 ∅10 mm, brushless, 8 Watt



M 1:1

EC

Stock program
Standard program
Special program (on request)

Part Numbers				
A with Hall sensors	315170	315171	315172	**315173**
B sensorless	315174	315175	315176	315177

Motor Data									
	Values at nominal voltage								
1	Nominal voltage	V	6	9	12	18			
2	No load speed	rpm	49200	52500	53200	57100			
3	No load current	mA	160	118	90.4	67.3			
4	Nominal speed	rpm	41700	45600	46600	50900			
5	Nominal torque (max. continuous torque)	mNm	1.74	1.63	1.62	1.61			
6	Nominal current (max. continuous current)	A	1.66	1.11	0.843	0.6			
7	Stall torque	mNm	12	13	13.7	15.6			
8	Stall current	A	10.4	8.05	6.46	5.27			
9	Max. efficiency	%	77	78	78	79			
	Characteristics								
10	Terminal resistance phase to phase	Ω	0.575	1.12	1.86	3.42			
11	Terminal inductance phase to phase	mH	0.00998	0.0198	0.0342	0.0671			
12	Torque constant	mNm/A	1.15	1.61	2.12	2.97			
13	Speed constant	rpm/V	8340	5920	4500	3220			
14	Speed/torque gradient	rpm/mNm	4180	4110	3940	3700			
15	Mechanical time constant	ms	3.03	2.97	2.85	2.68			
16	Rotor inertia	gcm²	0.0691	0.0691	0.0691	0.0691			

Specifications

Thermal data

17	Thermal resistance housing-ambient	39.8 K/W
18	Thermal resistance winding-housing	5.1 K/W
19	Thermal time constant winding	1.51 s
20	Thermal time constant motor	221 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+125°C

Mechanical data (preloaded ball bearings)

23	Max. speed		65 000 rpm
24	Axial play at axial load	< 0.2 N	0 mm
		> 0.2 N	max. 0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		0.16 N
27	Max. force for press fits (static)		12 N
	(static, shaft supported)		250 N
28	Max. radial load, 5 mm from flange		2 N

Other specifications

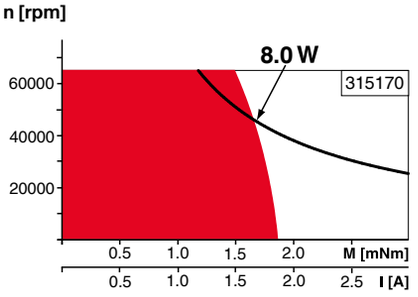
29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	13 g

Values listed in the table are nominal.

Connection	**with Hall sensors**	**sensorless**
Pin 1	V_{Hall} 4.5...24 VDC	Motor winding 1
Pin 2	Hall sensor 3	Motor winding 2
Pin 3	Hall sensor 1	Motor winding 3
Pin 4	Hall sensor 2	N.C.
Pin 5	GND	
Pin 6	Motor winding 3	
Pin 7	Motor winding 2	
Pin 8	Motor winding 1	
Adapter	**Part number**	**Part number**
see p. 514	220300	220310
Connector	**Part number**	**Part number**
TE	1-84953-1	84953-4
Molex	52207-1133	52207-0433

Pin for design with Hall sensors:
FPC, 11-pol, Pitch 1.0 mm, top contact style
Wiring diagram for Hall sensors see page 47

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

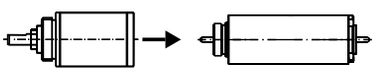
Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 36

Planetary Gearhead
∅10 mm
0.01 - 0.15 Nm
Page 361



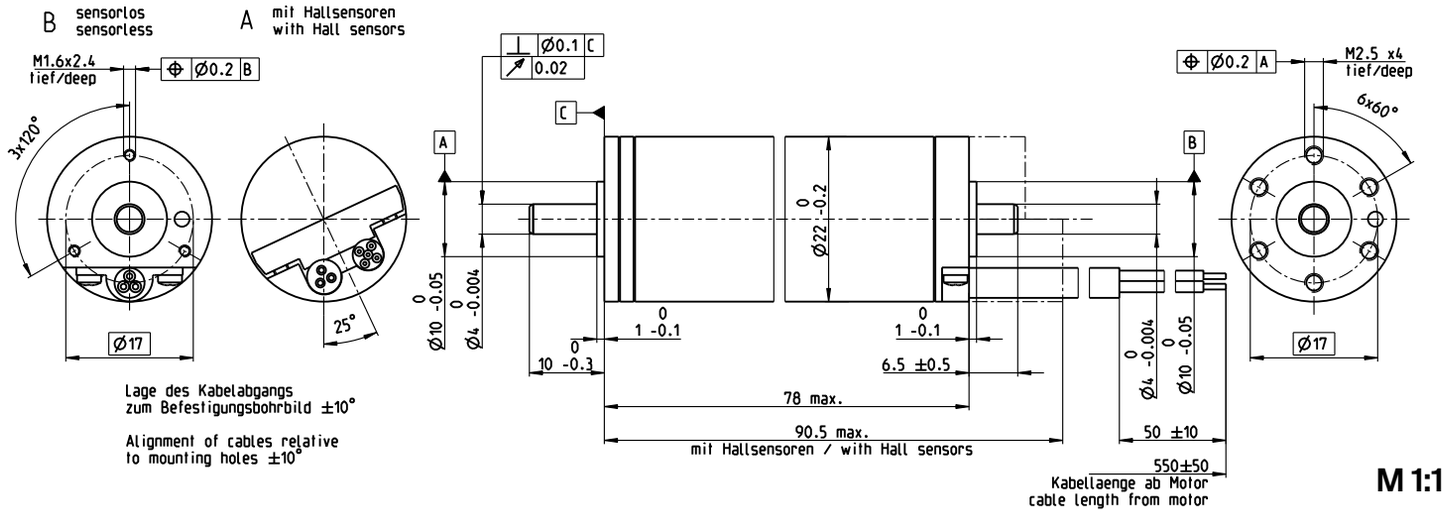
Recommended Electronics:

Notes	Page **36**
ESCON Module 24/2	486
ESCON 36/3 EC	487
ESCON Mod. 50/4 EC-S	487
DEC Module 24/2	491

EC 22 ∅22 mm, brushless, 80 Watt

Heavy Duty – for applications in air

EC



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers	
A with Hall sensors	426448
B sensorless	426449

Motor Data (provisional)						
Values at nominal voltage and ambient temperature °C		**25**	**100**	**150**	**200**	
1 Nominal voltage	V	48	48	48	48	
2 No load speed	rpm	13300	13600	13800	14100	
3 No load current	mA	63.9	53.4	54.9	56.5	
4 Nominal speed[1]	rpm	11400	11700	12200	13200	
5 Nominal torque (max. continuous torque)[1]	mNm	57.9	44	32.4	14.9	
6 Nominal current (max. continuous current)	A	1.72	1.35	1.03	0.515	
7 Stall torque	mNm	460	346	295	256	
8 Stall current	A	13.4	10.3	8.98	7.93	
9 Max. efficiency	%	87	86	85	84	
Characteristics						
10 Terminal resistance phase to phase	Ω	3.59	4.64	5.35	6.05	
11 Terminal inductance phase to phase	mH	0.626	0.626	0.626	0.626	
12 Torque constant	mNm/A	34.4	33.5	32.9	32.3	
13 Speed constant	rpm/V	278	285	290	296	
14 Speed / torque gradient	rpm/mNm	29	39.5	47.2	55.4	
15 Mechanical time constant	ms	2.31	3.16	3.77	4.43	
16 Rotor inertia	gcm²	7.63	7.63	7.63	7.63	

[1] Values for operation in thermal equilibrium.

Specifications

Thermal data

17	Thermal resistance housing-ambient	9.12 K/W
18	Thermal resistance winding-housing	0.92 K/W
19	Thermal time constant winding	5.84 s
20	Thermal time constant motor	462 s
21	Ambient temperature	-55...+200°C
22	Max. winding temperature	+240°C

Mechanical data (preloaded ball bearings)

23	Max. speed	20 000 rpm
24	Axial play at axial load < 5 N	0 mm
	> 5 N	max. 0.14 mm
25	Radial play	preloaded
26	Max. axial load (dynamic)	8 N
27	Max. force for press fits (static)	98 N
	(static, shaft supported)	250 N
28	Max. radial load, 5 mm from flange	16 N

Other specifications

29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	210 g

Connection A, motor cable PTFE (AWG 19)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors cable PTFE (AWG 24)

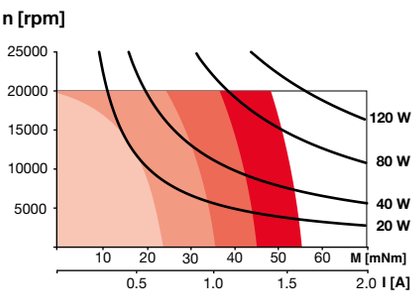
green	V_{Hall} 4.5...24 V
blue	GND
red	Hall sensor 1
black	Hall sensor 2
white	Hall sensor 3

Connection B, motor cable PTFE (AWG 19)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Wiring diagram for Hall sensors see p. 47

Operating Range



Comments

TA = 25°C
TA = 100°C
TA = 150°C
TA = 200°C

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

Application

General
- extreme temperature applications
- vibration tested (according to MIL-STD810F/Jan2000 Fig. 514.5C-10)
- ultra-high vacuum applications (modifications necessary). low outgassing, can be baked out at 240°C

Aerospace
- gas turbine starter/generators for aircraft engines
- regulation of combustion engines

Oil & Gas Industry
- oil, gas and geothermal wells

Robotics
- robotic exploration vehicles

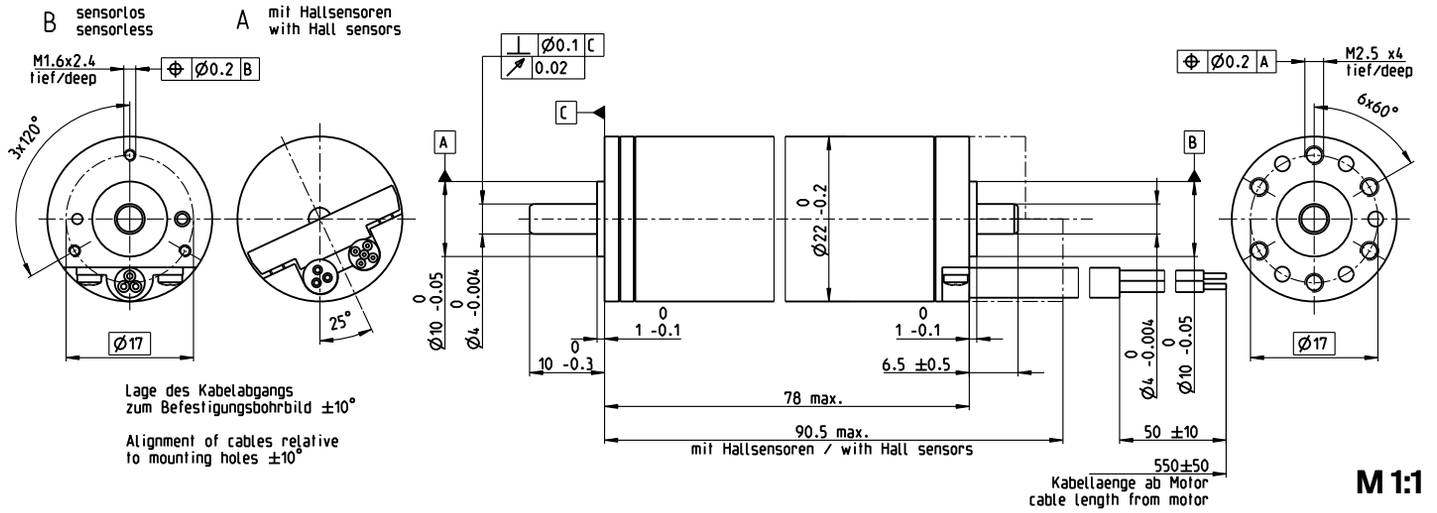
Industry
- pumps and valves for liquid metal cooling systems/turbine fuel and steam control
- valve adjustment for gas and steam power plants

Notice

This motor contains leaded solder. It therefore does not fulfill the requirements for the permitted maximum concentration of hazardous substances in accordance with the EC directive 2011/65/EC (RoHS) for all applications. The motor may therefore only be used for devices that are not subject to this directive.

EC 22 ∅22 mm, brushless, 240 Watt

Heavy Duty – for applications in oil



EC

Stock program
Standard program
Special program (on request)

Part Numbers	
A with Hall Sensors	426450
B sensorless	426451

Motor Data (provisional)									
Values at nominal voltage and ambient temperature °C		**25**	**100**	**150**	**200**				
1	Nominal voltage	V	48	48	48	48			
2	No load speed	rpm	12900	13400	13600	13800			
3	No load current	mA	384	177	183	188			
4	Nominal speed[1]	rpm	8410	8510	9130	10600			
5	Nominal torque (max. continuous torque)[1]	mNm	149	120	92.2	55.8			
6	Nominal current (max. continuous current)	A	4.48	3.61	2.88	1.86			
7	Stall torque	mNm	460	346	295	256			
8	Stall current	A	13.4	10.3	8.98	7.93			
9	Max. efficiency	%	71	77	75	73			
	Characteristics								
10	Terminal resistance phase to phase	Ω	3.59	4.64	5.35	6.05			
11	Terminal inductance phase to phase	mH	0.626	0.626	0.626	0.626			
12	Torque constant	mNm/A	34.4	33.5	32.9	32.3			
13	Speed constant	rpm/V	278	285	290	296			
14	Speed / torque gradient	rpm/mNm	29	39.5	47.2	55.4			
15	Mechanical time constant	ms	2.31	3.16	3.77	4.43			
16	Rotor inertia	gcm²	7.63	7.63	7.63	7.63			

[1] Values in thermal steady state.

Specifications

	Thermal data	
17	Thermal resistance housing-ambient	0.793 K/W
18	Thermal resistance winding-housing	0.754 K/W
19	Thermal time constant winding	4.78 s
20	Thermal time constant motor	40.2 s
21	Ambient temperature	-55...+200°C
22	Max. winding temperature	+240°C
	Mechanical data (preloaded ball bearings)	
23	Max. speed	20 000 rpm
24	Axial play at axial load < 5 N	0 mm
	> 5 N	max. 0.14 mm
25	Radial play	preloaded
26	Max. axial load (dynamic)	8 N
27	Max. force for press fits (static)	98 N
	(static, shaft supported)	250 N
28	Max. radial load, 5 mm from flange	16 N
	Other specifications	
29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	210 g

Connection A, motor cable PTFE (AWG 19)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors cable PTFE (AWG 24)

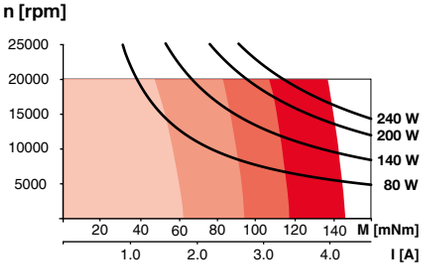
green	V_{Hall} 4.5...24 V
blue	GND
red	Hall sensor 1
black	Hall sensor 2
white	Hall sensor 3

Connection B, motor cable PTFE (AWG 19)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Wiring diagram for Hall sensors see p. 47

Operating Range



Comments

TA = 25°C
TA = 100°C
TA = 150°C
TA = 200°C

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

Application

General
- extreme temperature applications
- vibration tested according to MIL-STD810F/ Jan2000 Fig. 514.5C-10
- operation in oil and high pressure (only minimal lubrication, therefore use under rated ambient conditions is not suggested)

Oil & Gas Industry
- oil, gas and geothermal wells

Notice

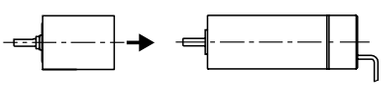
This motor contains leaded solder. It therefore does not fulfill the requirements for the permitted maximum concentration of hazardous substances in accordance with the EC directive 2011/65/EC (RoHS) for all applications. The motor may therefore only be used for devices that are not subject to this directive.

Reference medium: Shell Tellus oil T32
Operation in oil of different viscosity will affect the motor data.

maxon modular system

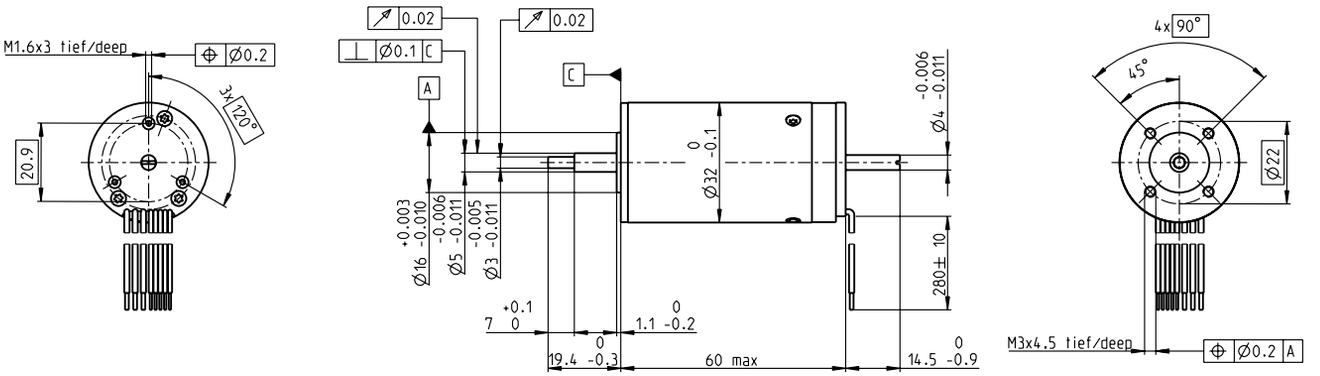
Details on catalog page 36

Planetary Gearhead
∅22 mm
2.0 - 4.0 Nm
Page 379



EC 32 ∅32 mm, brushless, 80 Watt

EC



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

	118891	118892	118888	118889	118893	118890
Motor Data						
Values at nominal voltage						
1 Nominal voltage V	12	18	18	24	36	48
2 No load speed rpm	15100	14300	13100	11000	14700	11300
3 No load current mA	662	404	349	199	211	104
4 Nominal speed rpm	13400	12700	11500	9450	13200	9740
5 Nominal torque (max. continuous torque) mNm	44.6	45.2	45.9	47.2	43.8	45.9
6 Nominal current (max. continuous current) A	6.51	4.15	3.82	2.46	2.07	1.23
7 Stall torque mNm	428	443	407	355	454	353
8 Stall current A	57.2	37.4	31.4	17.3	19.7	8.84
9 Max. efficiency %	80	81	81	80	81	80
Characteristics						
10 Terminal resistance phase to phase Ω	0.21	0.481	0.573	1.39	1.83	5.43
11 Terminal inductance phase to phase mH	0.03	0.0752	0.09	0.226	0.285	0.856
12 Torque constant mNm/A	7.48	11.8	13	20.5	23.1	40
13 Speed constant rpm/V	1280	806	737	465	414	239
14 Speed/torque gradient rpm/mNm	35.8	32.7	32.6	31.5	32.8	32.5
15 Mechanical time constant ms	7.49	6.86	6.82	6.59	6.87	6.8
16 Rotor inertia gcm²	20	20	20	20	20	20

Specifications

Thermal data

17	Thermal resistance housing-ambient	5.4 K/W
18	Thermal resistance winding-housing	2.5 K/W
19	Thermal time constant winding	14.8 s
20	Thermal time constant motor	1180 s
21	Ambient temperature	-20...+100°C
22	Max. winding temperature	+125°C

Mechanical data (preloaded ball bearings)

23	Max. speed[1]		25000 rpm
24	Axial play at axial load	< 8 N	0 mm
		> 8 N	max. 0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		5.6 N
27	Max. force for press fits (static)		98 N
	(static, shaft supported)		1200 N
28	Max. radial load, 5 mm from flange		28 N

Other specifications

29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	270 g

Values listed in the table are nominal.

Connection motor (Cable AWG 22)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

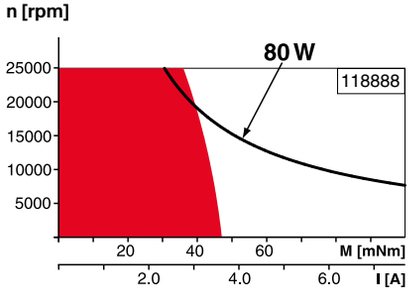
Connection sensors (Cable AWG 26)[1]

green	V_{Hall} 4.5...24 VDC
blue	GND
red/grey	Hall sensor 1
black/grey	Hall sensor 2
white/grey	Hall sensor 3

Wiring diagram for Hall sensors see p. 47

[1] Not lead through in combination with resolver.

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

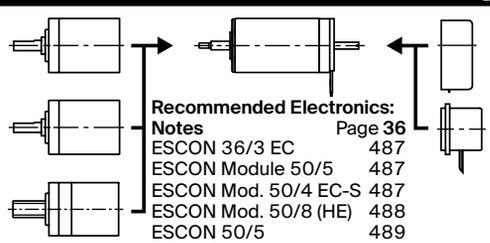
maxon Modular System

Details on catalog page 36

Planetary Gearhead
∅32 mm
0.75 - 4.5 Nm
Page 383

Planetary Gearhead
∅32 mm
0.75 - 6.0 Nm
Page 385–390

Screw Drive
∅32 mm
Page 416–421



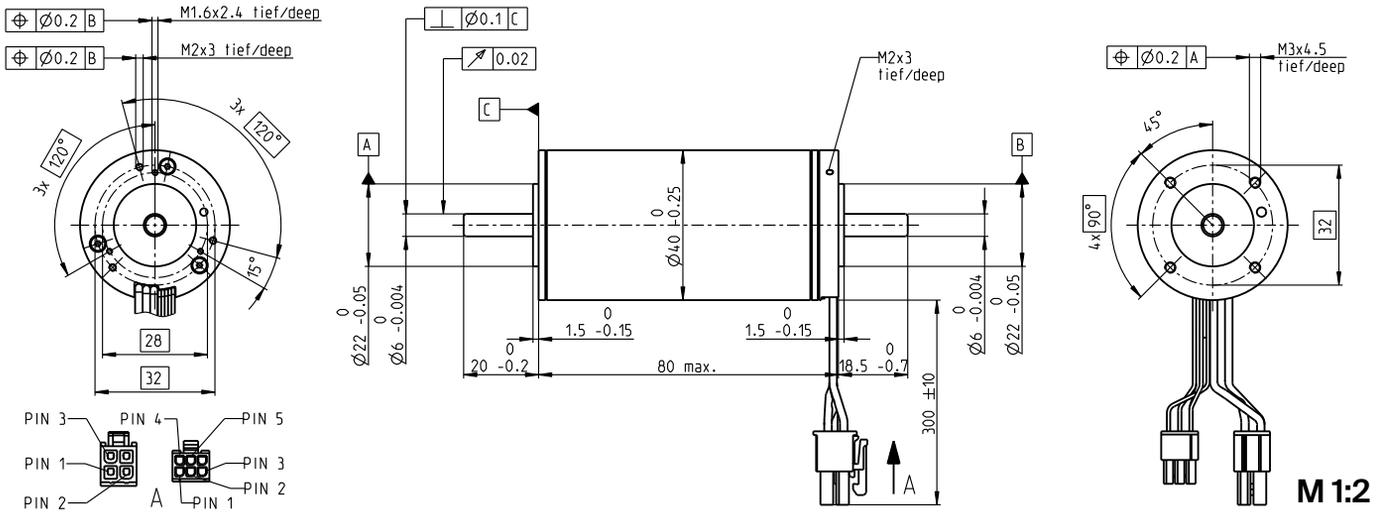
Recommended Electronics:

Notes	Page **36**
ESCON 36/3 EC	487
ESCON Module 50/5	487
ESCON Mod. 50/4 EC-S	487
ESCON Mod. 50/8 (HE)	488
ESCON 50/5	489
DEC Module 50/5	491
EPOS4 Micro 24/5	495
EPOS4 Mod./Comp. 50/5	496
EPOS4 Comp. 24/5 3-axes	497
EPOS4 Module 50/8	497
EPOS4 Comp. 50/8 CAN	499
EPOS4 50/5	501
EEPOS4 70/15	501
EPOS2 P 24/5	504

Encoder HED_5540
500 CPT,
3 channels
Page 472/474

Resolver Res 26
∅26 mm
10 V
Page 481

EC 40 ∅40 mm, brushless, 170 Watt



Stock program
Standard program
Special program (on request)

Part Numbers

	369146	393023	393024	393025
Motor Data (provisional)				
Values at nominal voltage				
1 Nominal voltage V	15	24	42	48
2 No load speed rpm	9840	9840	10100	9840
3 No load current mA	654	408	243	204
4 Nominal speed rpm	9090	9130	9380	9150
5 Nominal torque (max. continuous torque) mNm	169	163	160	163
6 Nominal current (max. continuous current) A	12.1	7.35	4.21	3.67
7 Stall torque mNm	2620	2660	2740	2760
8 Stall current A	181	115	69.1	59.6
9 Max. efficiency %	89	89	89	89
Characteristics				
10 Terminal resistance phase to phase Ω	0.0829	0.209	0.608	0.806
11 Terminal inductance phase to phase mH	0.0329	0.0843	0.246	0.337
12 Torque constant mNm/A	14.5	23.2	39.6	46.4
13 Speed constant rpm/V	659	412	241	206
14 Speed/torque gradient rpm/mNm	3.77	3.71	3.7	3.57
15 Mechanical time constant ms	2.12	2.09	2.08	2.01
16 Rotor inertia gcm²	53.8	53.8	53.8	53.8

Specifications

Thermal data

17	Thermal resistance housing-ambient	5.21 K/W
18	Thermal resistance winding-housing	1.05 K/W
19	Thermal time constant winding	18.7 s
20	Thermal time constant motor	1910 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+155°C

Mechanical data (preloaded ball bearings)

23	Max. speed		18 000 rpm
24	Axial play at axial load	< 9 N	0 mm
		> 9 N	max. 0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		23 N
27	Max. force for press fits (static)		106 N
	(static, shaft supported)		5500 N
28	Max. radial load, 5 mm from flange		75 N

Other specifications

29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	580 g

Values listed in the table are nominal.

Connection motor (Cable AWG 16)

red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

Connector	**Part number**
Molex	39-01-2040

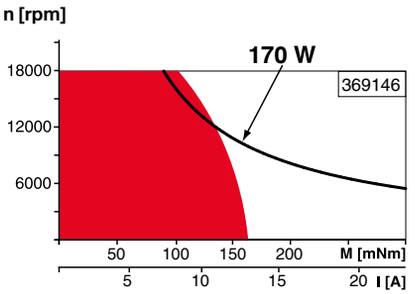
Connection sensors (Cable AWG 26)

yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V_{Hall} 3...24 VDC	Pin 5
	N.C.	Pin 6

Connector	**Part number**
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 47

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

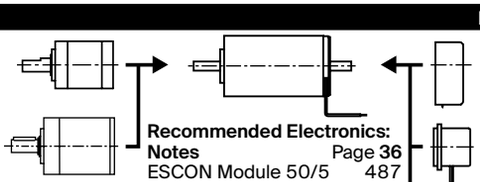
Assigned power rating

maxon Modular System

Details on catalog page 36

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 396

Planetary Gearhead
∅52 mm
4 - 30 Nm
Page 401



Recommended Electronics:

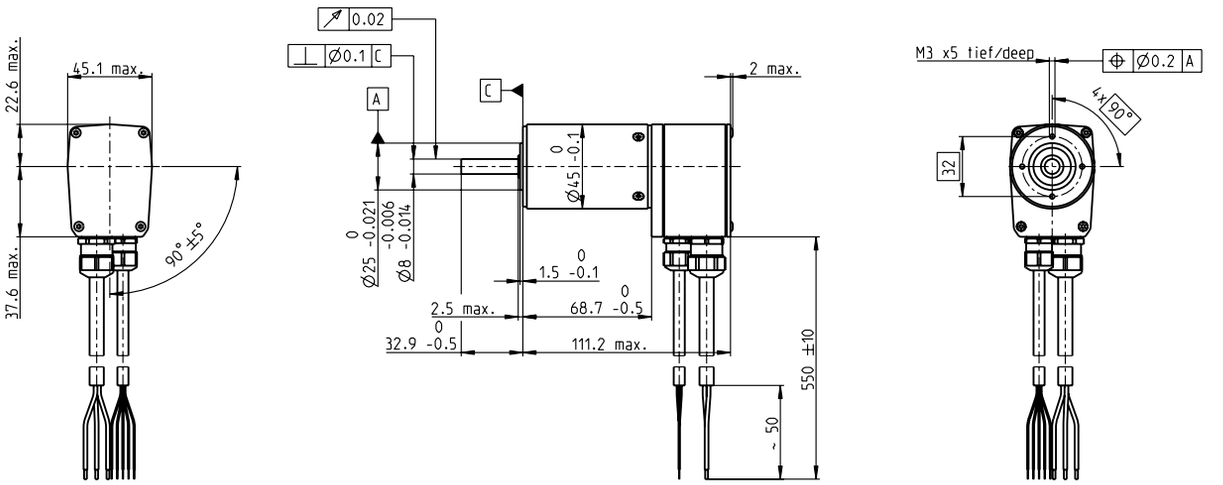
Notes	Page **36**
ESCON Module 50/5	487
ESCON Mod. 50/4 EC-S	487
ESCON Mod. 50/8 (HE)	488
ESCON 50/5	489
ESCON 70/10	489
DEC Module 50/5	491
EPOS4 Mod./Comp. 50/5	496
EPOS4 Mod./Comp. 50/8	497
EPOS4 Mod./Comp. 50/15	497
EPOS4 50/5	501
EPOS4 70/15	501
EPOS2 P 24/5	504

Encoder HED_5540
500 CPT,
3 channels
Page 472/474

Resolver Res 26
∅26 mm
10 V
Page 481

Brake AB 32
24 VDC
0.4 Nm
Page 521

EC 45 ∅45 mm, brushless, 150 Watt



M 1:4

Stock program
Standard program
Special program (on request)

Part Numbers

		136202	136196	136203	136197	136204	136198	136205	136200	136206	136201
Motor Data											
	Values at nominal voltage										
1	Nominal voltage	V	12	12	18	18	24	24	36	36	48	48
2	No load speed	rpm	9780	5650	10300	5930	10500	6090	9360	5400	10200	5860
3	No load current	mA	1530	577	1120	419	879	328	471	177	411	154
4	Nominal speed	rpm	8410	4370	9000	4680	9290	4840	8150	4190	8960	4640
5	Nominal torque (max. continuous torque)	mNm	174	186	171	184	169	183	179	191	174	187
6	Nominal current (max. continuous current)	A	16.2	9.65	11.2	6.72	8.55	5.13	5.29	3.14	4.21	2.52
7	Stall torque	mNm	1380	872	1540	931	1600	952	1560	911	1650	962
8	Stall current	A	119	43.6	93.3	32.6	74.8	25.6	43.1	14.5	37.2	12.5
9	Max. efficiency	%	79	79	80	79	80	79	81	80	81	80
	Characteristics											
10	Terminal resistance phase to phase	Ω	0.101	0.275	0.193	0.552	0.321	0.936	0.836	2.48	1.29	3.85
11	Terminal inductance phase to phase	mH	0.0266	0.0797	0.0542	0.163	0.0917	0.275	0.263	0.788	0.395	1.19
12	Torque constant	mNm/A	11.5	20	16.5	28.6	21.4	37.1	36.3	62.8	44.5	77.1
13	Speed constant	rpm/V	827	478	579	334	445	257	263	152	214	124
14	Speed/torque gradient	rpm/mNm	7.22	6.58	6.78	6.46	6.67	6.49	6.07	6	6.22	6.18
15	Mechanical time constant	ms	8.99	8.19	8.44	8.05	8.32	8.08	7.56	7.48	7.75	7.7
16	Rotor inertia	gcm²	119	119	119	119	119	119	119	119	119	119

Specifications

Thermal data

17	Thermal resistance housing-ambient	1.9 K/W
18	Thermal resistance winding-housing	0.9 K/W
19	Thermal time constant winding	15.4 s
20	Thermal time constant motor	1600 s
21	Ambient temperature	-20...+100°C
22	Max. winding temperature	+125°C

Mechanical data (preloaded ball bearings)

23	Max. speed		15000 rpm
24	Axial play at axial load	< 20 N	0 mm
		> 20 N	max. 0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		16 N
27	Max. force for press fits (static)		182 N
	(static, shaft supported)		5000 N
28	Max. radial load, 5 mm from flange		140 N

Other specifications

29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	850 g
	Protection to	IP54*

Values listed in the table are nominal.

Connection motor (Cable AWG 16)

Cable 1	Motor winding 1
Cable 2	Motor winding 2
Cable 3	Motor winding 3

Connection sensors (Cable AWG 24)[1)]

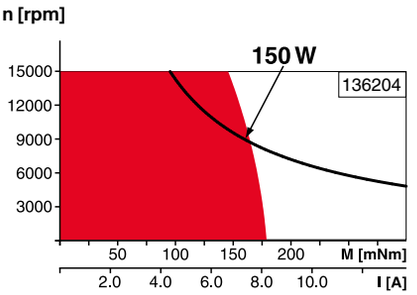
white	Hall sensor 3
brown	Hall sensor 2
green	Hall sensor 1
yellow	GND
grey	V_{Hall} 4.5 ... 24 VDC

Wiring diagram for Hall sensors see p. 47

[1)] Not lead through in combination with resolver.

*Protection level only when installed with flange-side seal.

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

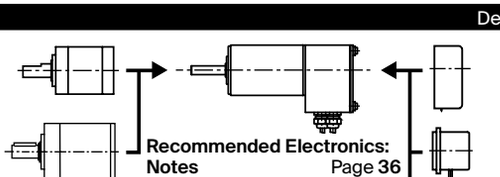
Assigned power rating

maxon Modular System

Details on catalog page 36

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 396

Planetary Gearhead
∅52 mm
4 - 30 Nm
Page 402



Recommended Electronics:

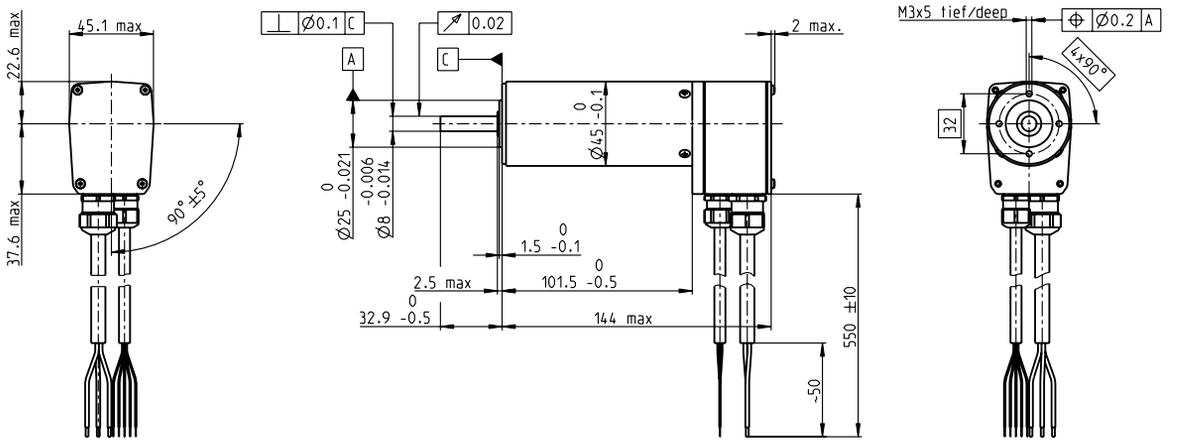
Notes	Page 36
ESCON 36/3 EC	487
ESCON Module 50/5	487
ESCON Mod. 50/4 EC-S	487
ESCON Mod. 50/8 (HE)	488
ESCON 50/5	489
ESCON 70/10	489
DEC Module 50/5	491
EPOS4 Mod./Comp. 50/5	496
EPOS4 Mod./Comp. 50/8	497
EPOS4 Mod./Comp. 50/15	497
EEPOS4 50/5	501
EPOS4 70/15	501
EPOS2 P 24/5	504

Encoder HEDL 9140
500 CPT,
3 channels
Page 478

Resolver Res 26
∅26 mm
10 V
Page 481

Brake AB 28
24 VDC
0.4 Nm
Page 520

EC 45 ∅45 mm, brushless, 250 Watt



M 1:4

EC

Stock program
Standard program
Special program (on request)

Part Numbers

	136210	136207	136211	136208	136212	136209
Motor Data						
Values at nominal voltage						
1 Nominal voltage V	24	24	36	36	48	48
2 No load speed rpm	8670	5000	10400	6010	10700	6160
3 No load current mA	897	341	834	312	656	244
4 Nominal speed rpm	7970	4300	9730	5320	10000	5490
5 Nominal torque (max. continuous torque) mNm	311	331	312	341	316	347
6 Nominal current (max. continuous current) A	12.5	7.51	10.2	6.21	7.94	4.86
7 Stall torque mNm	4400	2540	5750	3320	6110	3530
8 Stall current A	167	55.8	175	58.3	143	47.7
9 Max. efficiency %	86	85	87	86	87	87
Characteristics						
10 Terminal resistance phase to phase Ω	0.143	0.43	0.206	0.617	0.336	1.01
11 Terminal inductance phase to phase mH	0.0565	0.17	0.0883	0.265	0.149	0.448
12 Torque constant mNm/A	26.3	45.5	32.8	56.9	42.7	73.9
13 Speed constant rpm/V	364	210	291	168	224	129
14 Speed/torque gradient rpm/mNm	1.98	1.98	1.82	1.82	1.76	1.76
15 Mechanical time constant ms	4.34	4.34	3.99	3.99	3.85	3.85
16 Rotor inertia gcm²	209	209	209	209	209	209

Specifications

Thermal data

17	Thermal resistance housing-ambient	1.7 K/W
18	Thermal resistance winding-housing	1.1 K/W
19	Thermal time constant winding	31 s
20	Thermal time constant motor	1570 s
21	Ambient temperature	-20...+100°C
22	Max. winding temperature	+125°C

Mechanical data (preloaded ball bearings)

23	Max. speed		12000 rpm
24	Axial play at axial load	< 20 N	0 mm
		> 20 N	max. 0.15 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		16 N
27	Max. force for press fits (static)		182 N
	(static, shaft supported)		5000 N
28	Max. radial load, 5 mm from flange		180 N

Other specifications

29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	1150 g
	Protection to	IP54*

Values listed in the table are nominal.

Connection motor (Cable AWG 16)

Cable 1	Motor winding 1
Cable 2	Motor winding 2
Cable 3	Motor winding 3

Connection sensors (Cable AWG 24)[1)]

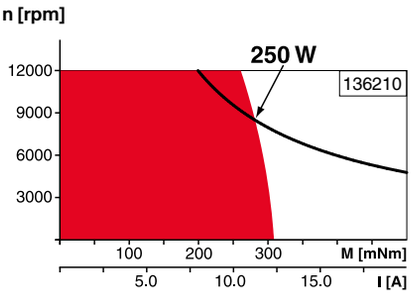
white	Hall sensor 3
brown	Hall sensor 2
green	Hall sensor 1
yellow	GND
grey	V_{Hall} 4.5...24 VDC

Wiring diagram for Hall sensors see p. 47

[1)] Not lead through in combination with resolver.

*Protection level only when installed with flange-side seal.

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

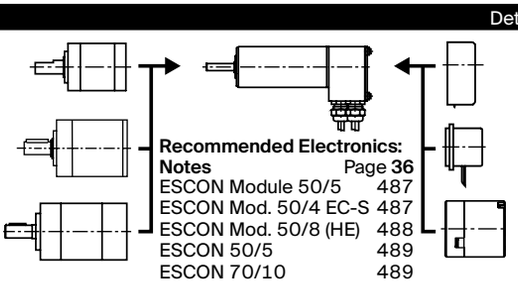
maxon Modular System

Details on catalog page 36

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 396

Planetary Gearhead
∅52 mm
4 - 30 Nm
Page 402

Planetary Gearhead
∅62 mm
8 - 50 Nm
Page 403



Recommended Electronics:

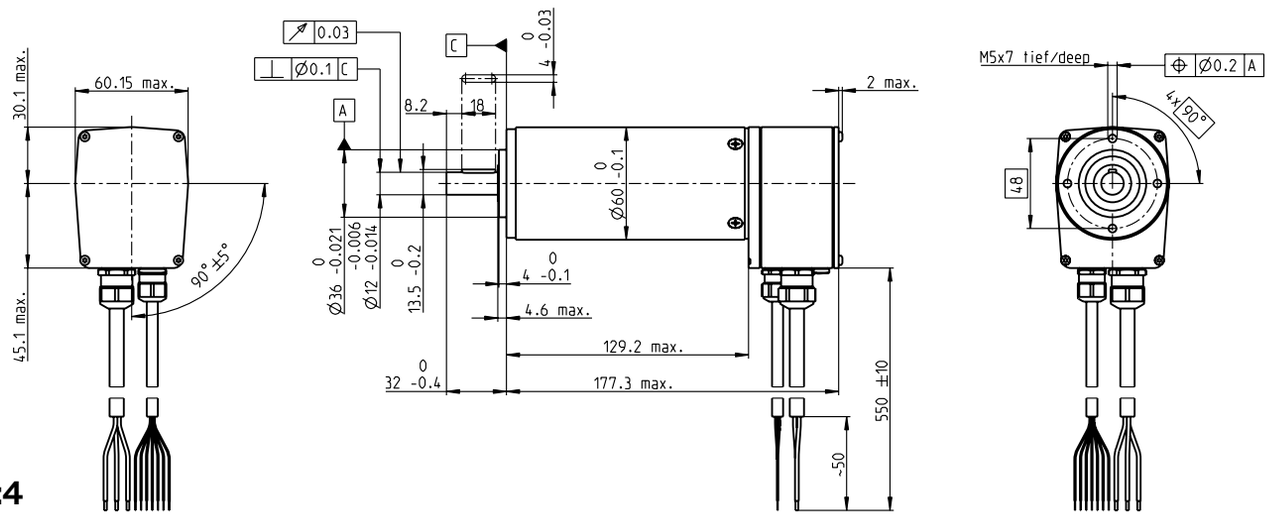
Notes	Page 36
ESCON Module 50/5	487
ESCON Mod. 50/4 EC-S	487
ESCON Mod. 50/8 (HE)	488
ESCON 50/5	489
ESCON 70/10	489
DEC Module 50/5	491
EPOS4 Mod./Comp. 50/5	496
EPOS4 Mod./Comp. 50/8	497
EPOS4 Mod./Comp. 50/15	497
EPOS4 50/5	501
EPOS4 70/15	501

Encoder HEDL 9140
500 CPT,
3 channels
Page 478

Resolver Res 26
∅26 mm
10 V
Page 481

Brake AB 28
24 VDC
0.4 Nm
Page 520

EC 60 ∅60 mm, brushless, 400 Watt



Stock program
Standard program
Special program (on request)

Part Numbers

	167132	167131
Motor Data		
Values at nominal voltage		
1 Nominal voltage V	48	48
2 No load speed rpm	5370	3100
3 No load current mA	670	268
4 Nominal speed rpm	4960	2680
5 Nominal torque (max. continuous torque) mNm	768	843
6 Nominal current (max. continuous current) A	9.56	5.9
7 Stall torque mNm	11800	6820
8 Stall current A	139	46.4
9 Max. efficiency %	87	86
Characteristics		
10 Terminal resistance phase to phase Ω	0.345	1.03
11 Terminal inductance phase to phase mH	0.273	0.82
12 Torque constant mNm/A	84.9	147
13 Speed constant rpm/V	113	65
14 Speed/torque gradient rpm/mNm	0.457	0.457
15 Mechanical time constant ms	3.98	3.98
16 Rotor inertia gcm²	831	831

Specifications

Thermal data

17	Thermal resistance housing-ambient	1.3 K/W
18	Thermal resistance winding-housing	0.5 K/W
19	Thermal time constant winding	33.9 s
20	Thermal time constant motor	1200 s
21	Ambient temperature	-20...+100°C
22	Max. winding temperature	+125°C

Mechanical data (preloaded ball bearings)

23	Max. speed		7000 rpm
24	Axial play at axial load	< 30 N	0 mm
		> 30 N	max. 0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		24 N
27	Max. force for press fits (static)		392 N
	(static, shaft supported)		6000 N
28	Max. radial load, 5 mm from flange		240 N

Other specifications

29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	2450 g
	Protection to	IP54*

Values listed in the table are nominal.

Connection motor (Cable AWG 16)

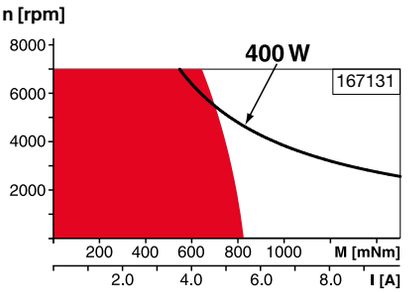
Cable 1	Motor winding 1
Cable 2	Motor winding 2
Cable 3	Motor winding 3

Connection sensors (Cable AWG 24)[1]

white	Hall sensor 3
brown	Hall sensor 2
green	Hall sensor 1
yellow	GND
grey	V_{Hall} 4.5 ... 24 VDC
blue	Temperature sensor (PTC)
pink	Temperature sensor (PTC)

[1] Not lead through in combination with resolver.
Temperature monitoring, PTC resistance Micropille 110°C, R 25°C < 0.7 kΩ, R 115°C ≥ 2.66 kΩ, R 125°C ≥ 8.0 kΩ
Wiring diagram for Hall sensors see p. 47

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

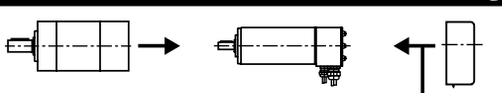
Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 36

Planetary Gearhead
∅81 mm
20 - 120 Nm
Page 404



Recommended Electronics:

Notes	Page **36**
ESCON Mod. 50/4 EC-S	487
ESCON Mod. 50/8 (HE)	488
ESCON 70/10	489
DEC Module 50/5	491
EPOS4 Module 50/15	497
EPOS4 Module 50/8	497
EPOS4 Comp. 50/8 CAN	499
EPOS4 Comp. 50/15 CAN	500
EPOS4 70/15	501

Encoder HEDL 9140
500 CPT,
3 channels
Page 478

Resolver Res
∅26 mm
10 V
Page 481

Brake AB 41
24 VDC
2.0 Nm
Page 523

*Protection level only when installed with flange-side seal.

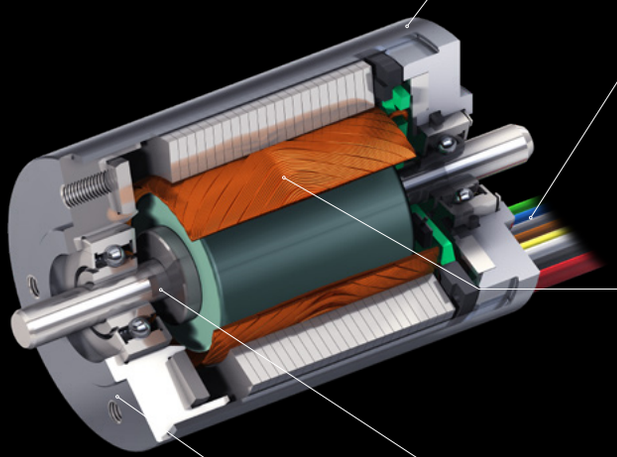
maxon EC-max

maxon EC-max

The electrically commutated maxon EC motors are longer-lasting than their counterparts in the DC range. The long life span offered by the brushless design can be exploited particularly well using preloaded ball bearings. The EC motors have excellent torque characteristics, high power, and a wide speed range. The outstanding controllability of the motors enables high-precision positioning tasks.

Key data

Motor ∅	10 ... 60 mm
Motor length	26 ... 180 mm
Power	0.5 ... 400 W
Nominal torque	up to 800 mNm
Max. permissible speed	up to 65 000 rpm



Metal housing and flange ensure good heat dissipation and mechanical stability.

Grooveless shaft ensures smooth running and extremely high torsional rigidity.

"The centerpiece" is the ironless maxon winding. Its physical design offer benefits such as: zero cogging torque, high efficiency and excellent control dynamics.

The motor housing is a steel tube – non-magnetic, rigid, coated.

Strain-relieved cables; dust-protected depending on the size, with or without connector.

- → Designed for long uptime
- → Performance optimized at high speeds of up to 65 000 rpm
- → Robust design
- → From diameter 45 mm with dust and splash protection

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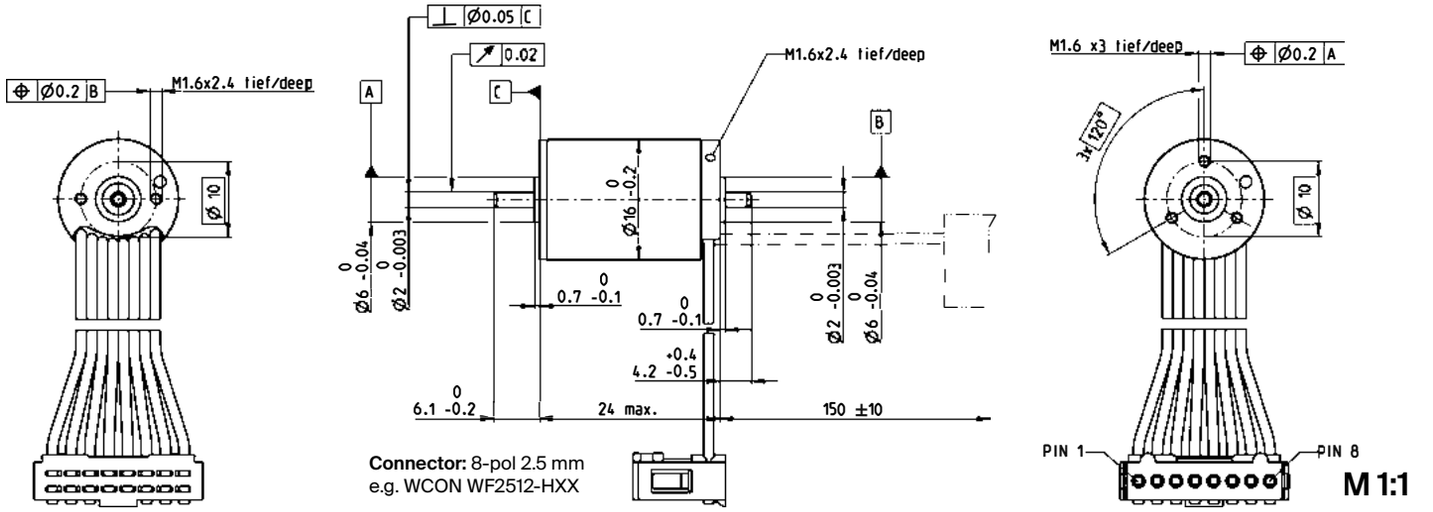
EC-max 16 ∅16 mm, brushless, 5 Watt



Connector: 8-pol 2.5 mm
e.g. WCON WF2512-HXX

Stock program
Standard program
Special program (on request)

Part Numbers

	283825	283826	283827	283828
Motor Data				
Values at nominal voltage				
1 Nominal voltage V	4.5	6	9	12
2 No load speed rpm	12800	13500	12600	13500
3 No load current mA	148	120	72.4	60.2
4 Nominal speed rpm	5170	5690	4920	5840
5 Nominal torque (max. continuous torque) mNm	3.33	3.2	3.29	3.23
6 Nominal current (max. continuous current) A	1.18	0.903	0.574	0.456
7 Stall torque mNm	5.82	5.79	5.64	5.95
8 Stall current A	1.89	1.49	0.901	0.762
9 Max. efficiency %	53	53	53	53
Characteristics				
10 Terminal resistance phase to phase Ω	2.38	4.04	9.99	15.7
11 Terminal inductance phase to phase mH	0.0396	0.0634	0.163	0.254
12 Torque constant mNm/A	3.08	3.9	6.26	7.8
13 Speed constant rpm/V	3100	2450	1530	1220
14 Speed/torque gradient rpm/mNm	2390	2540	2440	2470
15 Mechanical time constant ms	10.7	11.4	10.9	11.1
16 Rotor inertia gcm^2	0.428	0.428	0.428	0.428

Specifications

Thermal data

17	Thermal resistance housing-ambient	23.5 K/W
18	Thermal resistance winding-housing	2.57 K/W
19	Thermal time constant winding	0.943 s
20	Thermal time constant motor	390 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+155°C

Mechanical data (preloaded ball bearings)

23	Max. speed		20 000 rpm
24	Axial play at axial load	< 1.5 N	0 mm
		> 1.5 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		1 N
27	Max. force for press fits (static)		18 N
	(static, shaft supported)		600 N
28	Max. radial load, 5 mm from flange		6 N

Other specifications

29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	36 g

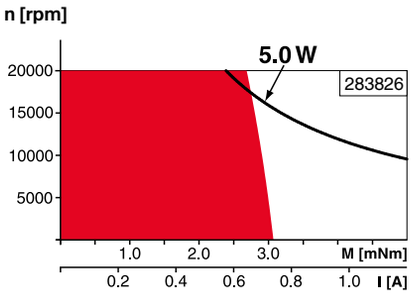
Values listed in the table are nominal.

Connection (Cable AWG 24)

brown	Motor winding 1	Pin 1
red	Motor winding 2	Pin 2
orange	Motor winding 3	Pin 3
yellow	V_{Hall} 3...24 VDC	Pin 4
green	GND	Pin 5
blue	Hall sensor 1	Pin 6
violet	Hall sensor 2	Pin 7
grey	Hall sensor 3	Pin 8

Wiring diagram for Hall sensors see p. 47

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

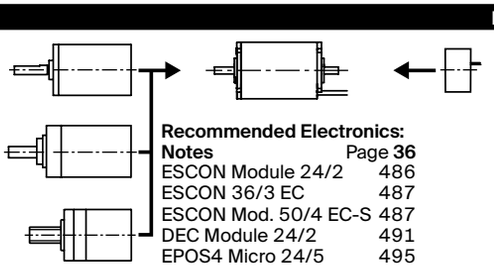
maxon Modular System

Details on catalog page 36

Planetary Gearhead
∅16 mm
0.1 - 0.3 Nm
Page 369

Planetary Gearhead
∅16 mm
0.2 - 0.6 Nm
Page 370

Screw Drive
∅16 mm
Page 411–413

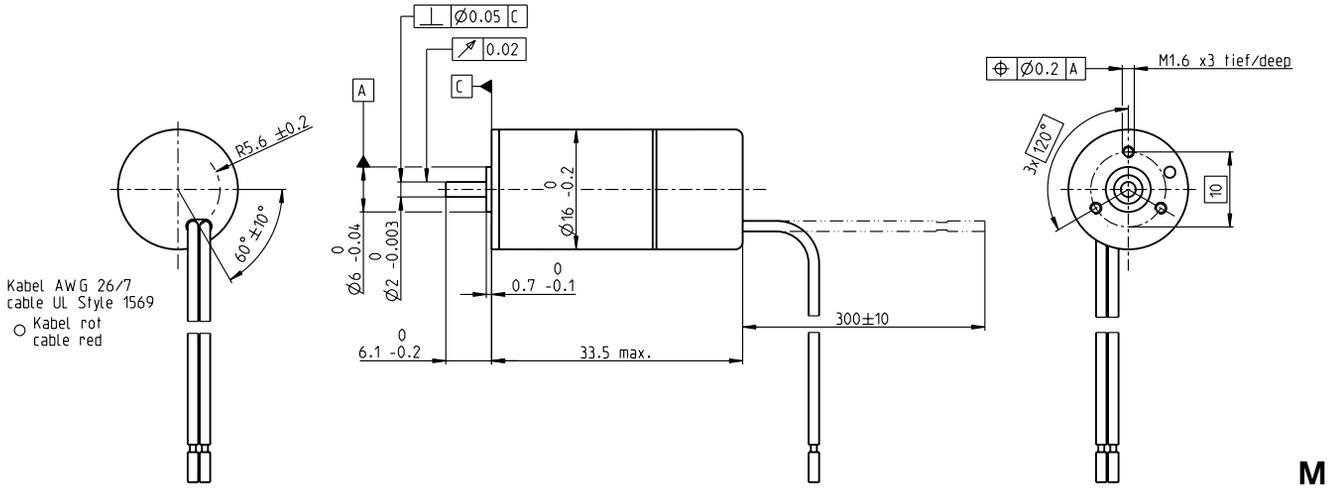


Encoder MR
128/256/512 CPT,
2/3 channels
Page 462

Recommended Electronics:

Notes	Page 36
ESCON Module 24/2	486
ESCON 36/3 EC	487
ESCON Mod. 50/4 EC-S	487
DEC Module 24/2	491
EPOS4 Micro 24/5	495
EPOS4 Mod./Comp. 24/1.5	496
EPOS4 Comp. 24/5 3-axes	497

EC-max 16 2-wire ∅16 mm, brushless, 5 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

	320816	320817	320818	320819
Motor Data				
Values at nominal voltage				
1 Nominal voltage V	5	6	9	12
2 No load speed rpm	14200	13400	12600	13800
3 No load current mA	189	149	97.4	72.7
4 Nominal speed rpm	8280	7510	6970	8080
5 Nominal torque (max. continuous torque) mNm	2.19	2.19	2.28	2.26
6 Nominal current (max. continuous current) A	0.903	0.714	0.465	0.37
7 Stall torque mNm	4.6	5.25	5.39	5.76
8 Stall current A	1.7	1.44	0.929	0.801
9 Max. efficiency %	47.3	46.4	46.2	49
Characteristics				
35 Type of control	controlled	controlled	controlled	controlled
36 Supply voltage $+V_{CC}$ V	5...15	5...15	5...15	5...15
12 Torque constant mNm/A	3.06	3.87	6.21	7.73
13 Speed constant rpm/V	3130	2470	1540	1230
14 Speed/torque gradient rpm/mNm	2440	2580	2480	2510
15 Mechanical time constant ms	10.9	11.6	11.1	11.3
16 Rotor inertia gcm^2	0.428	0.428	0.428	0.428
39 Speed range rpm	14200-20000	11300-20000	6720-20000	5360-17400

Specifications

Thermal data

17	Thermal resistance housing-ambient	23.5 K/W
18	Thermal resistance winding-housing	2.57 K/W
19	Thermal time constant winding	0.943 s
20	Thermal time constant motor	390 s
21	Ambient temperature	-40...+85°C
22	Max. temperature of electronics (max. loading capacity of the motor is defined by the electronics)	+100°C

Mechanical data (preloaded ball bearings)

23	Max. speed		20000 rpm
24	Axial play at axial load	< 1.5 N	0 mm
		> 1.5 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		1 N
27	Max. force for press fits (static)		18 N
28	Max. radial load, 5 mm from flange		6 N

Other specifications

31	Weight of motor	32 g
	Direction of rotation	Clockwise (CW)

Values listed in the table are nominal.

Connection (Cable AWG 26/7 UL Style 1569)
red $+V_{CC}$
black GND

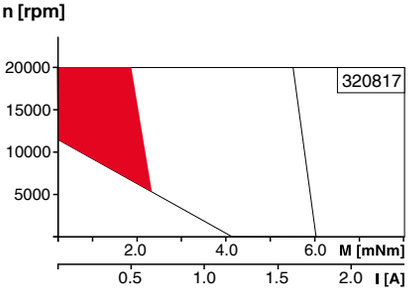
Protective functions

Inverse-polarity protection up to max.	18 VDC
Blockage protection at speed	< 76 rpm
Temperature monitoring	> 104°C
Current limitation	1.6 A ± 15%
Low voltage monitoring	< 4 VDC

⚠ **Attention:** Operating voltage V_{CC} > 18 VDC will destroy the electronics

Option: Direction of rotation counter-clockwise (CCW)

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

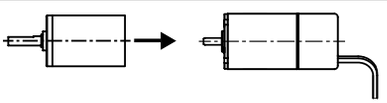
Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

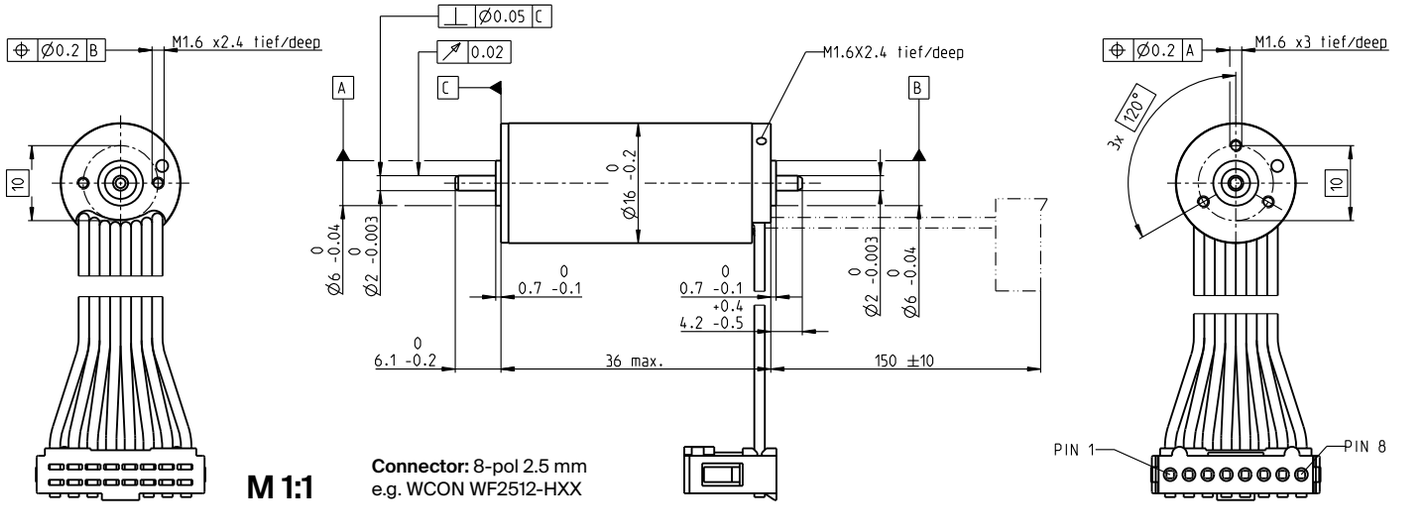
maxon Modular System

Details on catalog page 36

Planetary Gearhead
∅16 mm
0.1 - 0.3 Nm
Page 369



EC-max 16 ∅16 mm, brushless, 8 Watt



M 1:1

Connector: 8-pol 2.5 mm
e.g. WCON WF2512-HXX

Stock program
Standard program
Special program (on request)

Part Numbers

	283831	283832	283833	283834	283835
Motor Data					
Values at nominal voltage					
1 Nominal voltage V	6	9	12	18	24
2 No load speed rpm	12000	11900	11900	11900	11900
3 No load current mA	130	85.1	64.2	42.6	31.9
4 Nominal speed rpm	7120	7090	7300	7170	7350
5 Nominal torque (max. continuous torque) mNm	7.66	7.8	8.02	7.87	8.19
6 Nominal current (max. continuous current) A	1.76	1.17	0.909	0.593	0.461
7 Stall torque mNm	19.2	19.8	21.1	20.3	22
8 Stall current A	4.17	2.82	2.27	1.45	1.17
9 Max. efficiency %	69	69	70	70	71
Characteristics					
10 Terminal resistance phase to phase Ω	1.44	3.19	5.3	12.4	20.5
11 Terminal inductance phase to phase mH	0.034	0.079	0.14	0.317	0.566
12 Torque constant mNm/A	4.61	7.02	9.32	14	18.7
13 Speed constant rpm/V	2070	1360	1020	681	510
14 Speed/torque gradient rpm/mNm	646	619	582	602	556
15 Mechanical time constant ms	5.75	5.51	5.18	5.36	4.95
16 Rotor inertia gcm²	0.85	0.85	0.85	0.85	0.85

Specifications

Thermal data

17	Thermal resistance housing-ambient	17.7 K/W
18	Thermal resistance winding-housing	1.41 K/W
19	Thermal time constant winding	0.9 s
20	Thermal time constant motor	427 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+155°C

Mechanical data (preloaded ball bearings)

23	Max. speed		20 000 rpm
24	Axial play at axial load	< 1.5 N	0 mm
		> 1.5 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		1 N
27	Max. force for press fits (static)		18 N
	(static, shaft supported)		400 N
28	Max. radial load, 5 mm from flange		6 N

Other specifications

29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	52 g

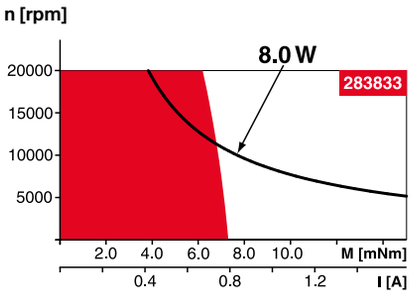
Values listed in the table are nominal.

Connection (Cable AWG 24)

brown	Motor winding 1	Pin 1
red	Motor winding 2	Pin 2
orange	Motor winding 3	Pin 3
yellow	V_{Hall} 3...24 VDC	Pin 4
green	GND	Pin 5
blue	Hall sensor 1	Pin 6
violet	Hall sensor 2	Pin 7
grey	Hall sensor 3	Pin 8

Wiring diagram for Hall sensors see p. 47

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

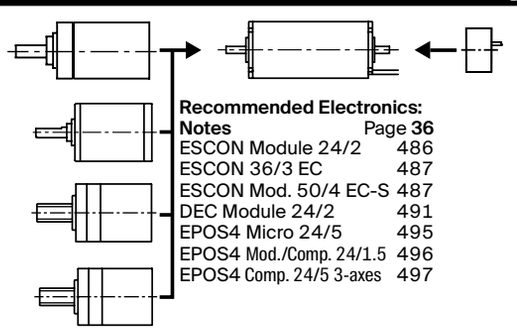
Details on catalog page 36

Planetary Gearhead
∅16 mm
0.2 - 0.6 Nm
Page 370

Planetary Gearhead
∅22 mm
0.5 - 2.0 Nm
Page 377

Screw Drive
∅16 mm
Page 411–413

Screw Drive
∅22 mm
Page 414/415

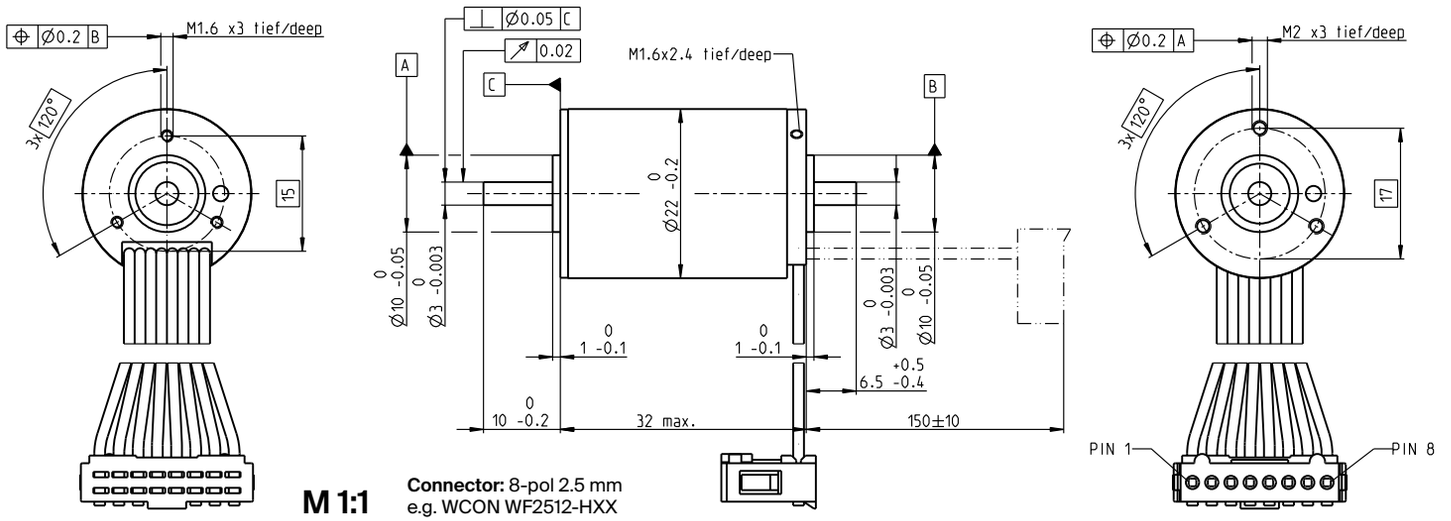


Recommended Electronics:

Notes	Page 36
ESCON Module 24/2	486
ESCON 36/3 EC	487
ESCON Mod. 50/4 EC-S	487
DEC Module 24/2	491
EPOS4 Micro 24/5	495
EPOS4 Mod./Comp. 24/1.5	496
EPOS4 Comp. 24/5 3-axes	497

Encoder MR
128/256/512 CPT,
2/3 channels
Page 462

EC-max 22 ∅22 mm, brushless, 12 Watt



M 1:1

Connector: 8-pol 2.5 mm
e.g. WCON WF2512-HXX

Stock program
Standard program
Special program (on request)

Part Numbers

		283837	283838	283839	283840	283841
Motor Data						
	Values at nominal voltage					
1	Nominal voltage	V	6	12	18	24	36
2	No load speed	rpm	11900	12100	12100	12100	12100
3	No load current	mA	301	155	103	77.3	51.6
4	Nominal speed	rpm	7920	8040	8250	8250	8210
5	Nominal torque (max. continuous torque)	mNm	11	10.2	10.9	10.8	10.6
6	Nominal current (max. continuous current)	A	2.61	1.25	0.88	0.657	0.432
7	Stall torque	mNm	33.9	31.3	35.4	35.1	34.1
8	Stall current	A	7.36	3.47	2.6	1.94	1.25
9	Max. efficiency	%	65	63	65	65	65
	Characteristics						
10	Terminal resistance phase to phase	Ω	0.816	3.46	6.93	12.4	28.7
11	Terminal inductance phase to phase	mH	0.0315	0.121	0.275	0.488	1.09
12	Torque constant	mNm/A	4.61	9.02	13.6	18.1	27.2
13	Speed constant	rpm/V	2070	1060	701	526	352
14	Speed/torque gradient	rpm/mNm	366	406	356	360	372
15	Mechanical time constant	ms	8.63	9.56	8.39	8.47	8.75
16	Rotor inertia	gcm²	2.25	2.25	2.25	2.25	2.25

Specifications

Thermal data

17	Thermal resistance housing-ambient	13.5 K/W
18	Thermal resistance winding-housing	1.72 K/W
19	Thermal time constant winding	1.85 s
20	Thermal time constant motor	567 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+155°C

Mechanical data (preloaded ball bearings)

23	Max. speed		18000 rpm
24	Axial play at axial load	< 4 N	0 mm
		> 4 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		3.5 N
27	Max. force for press fits (static)		53 N
	(static, shaft supported)		1400 N
28	Max. radial load, 5 mm from flange		16 N

Other specifications

29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	83 g

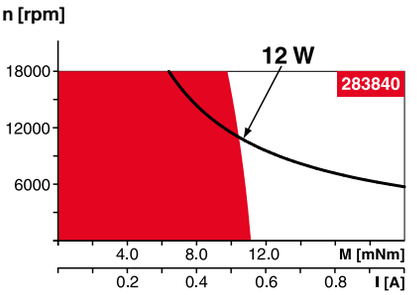
Values listed in the table are nominal.

Connection (Cable AWG 24)

brown	Motor winding 1	Pin 1
red	Motor winding 2	Pin 2
orange	Motor winding 3	Pin 3
yellow	V_{Hall} 3...24 VDC	Pin 4
green	GND	Pin 5
blue	Hall sensor 1	Pin 6
violet	Hall sensor 2	Pin 7
grey	Hall sensor 3	Pin 8

Wiring diagram for Hall sensors see p. 47

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

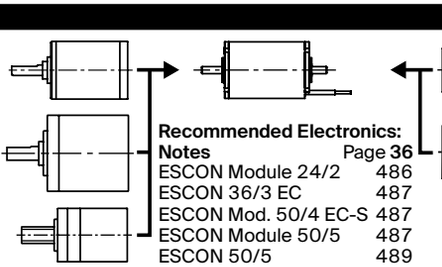
maxon Modular System

Details on catalog page 36

Planetary Gearhead
∅22 mm
0.5 - 3.4 Nm
Page 377/378

Koaxdrive
∅32 mm
1.0 - 4.5 Nm
Page 394

Screw Drive
∅22 mm
Page 414/415



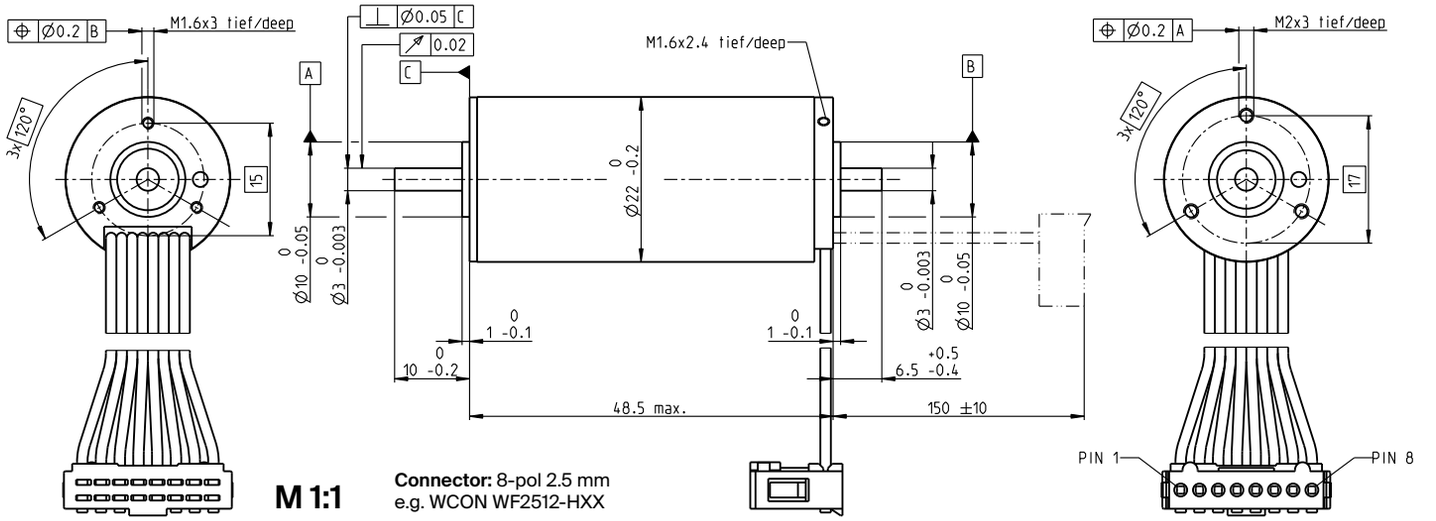
Recommended Electronics:

Notes	Page 36
ESCON Module 24/2	486
ESCON 36/3 EC	487
ESCON Mod. 50/4 EC-S	487
ESCON Module 50/5	487
ESCON 50/5	489
DEC Module 24/2	491
DEC Module 50/5	491
EPOS4 Micro 24/5	495
EPOS4 Mod./Comp. 24/1.5	496
EPOS4 Mod./Comp. 50/5	496
EPOS4 Comp. 24/5 3-axes	497
EPOS4 50/5	501
EPOS2 P 24/5	504

Encoder MR
128/256/512 CPT,
2/3 channels
Page 462

Brake AB 20
24 VDC
0.1 Nm
Page 516

EC-max 22 ∅22 mm, brushless, 25 Watt



M 1:1

Connector: 8-pol 2.5 mm
e.g. WCON WF2512-HXX

Stock program
Standard program
Special program (on request)

Part Numbers

		283856	283857	283858	283859	283860
Motor Data						
	Values at nominal voltage					
1	Nominal voltage	V	12	18	24	36	48
2	No load speed	rpm	12400	12900	12900	12200	12900
3	No load current	mA	226	161	121	73.5	60.4
4	Nominal speed	rpm	9800	10300	10400	9630	10500
5	Nominal torque (max. continuous torque)	mNm	23	21.8	22.7	22.5	23.2
6	Nominal current (max. continuous current)	A	2.71	1.8	1.4	0.872	0.716
7	Stall torque	mNm	114	112	121	111	127
8	Stall current	A	12.6	8.55	6.97	4	3.66
9	Max. efficiency	%	76	75	76	75	77
	Characteristics						
10	Terminal resistance phase to phase	Ω	0.955	2.1	3.44	9.01	13.1
11	Terminal inductance phase to phase	mH	0.05	0.103	0.182	0.462	0.729
12	Torque constant	mNm/A	9.1	13	17.4	27.7	34.8
13	Speed constant	rpm/V	1050	732	549	345	274
14	Speed/torque gradient	rpm/mNm	110	118	109	112	103
15	Mechanical time constant	ms	5.14	5.5	5.06	5.23	4.82
16	Rotor inertia	gcm²	4.45	4.45	4.45	4.45	4.45

Specifications

Thermal data

17	Thermal resistance housing-ambient		10.2 K/W
18	Thermal resistance winding-housing		1.02 K/W
19	Thermal time constant winding		1.99 s
20	Thermal time constant motor		628 s
21	Ambient temperature		-40...+100°C
22	Max. winding temperature		+155°C

Mechanical data (preloaded ball bearings)

23	Max. speed		18 000 rpm
24	Axial play at axial load	< 4 N	0 mm
		> 4 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		3.5 N
27	Max. force for press fits (static)		60 N
	(static, shaft supported)		1000 N
28	Max. radial load, 5 mm from flange		16 N

Other specifications

29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	110 g

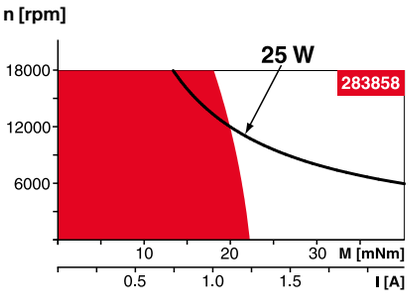
Values listed in the table are nominal.

Connection (Cable AWG 24)

brown	Motor winding 1	Pin 1
red	Motor winding 2	Pin 2
orange	Motor winding 3	Pin 3
yellow	V_{Hall} 3...24 VDC	Pin 4
green	GND	Pin 5
blue	Hall sensor 1	Pin 6
violet	Hall sensor 2	Pin 7
grey	Hall sensor 3	Pin 8

Wiring diagram for Hall sensors see p. 47

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

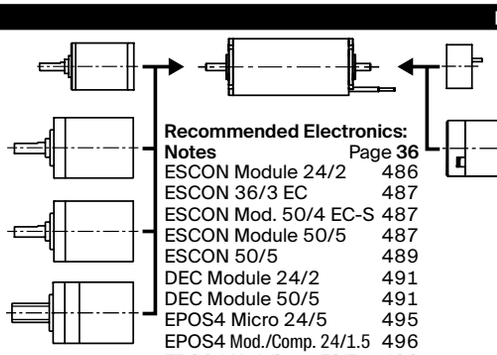
Details on catalog page 36

Planetary Gearhead
∅22 mm
0.5 - 3.4 Nm
Page 375/378

Planetary Gearhead
∅32 mm
1.0 - 6.0 Nm
Page 388

Koaxdrive
∅32 mm
1.0 - 4.5 Nm
Page 394

Screw Drive
∅32 mm
Page 416–421



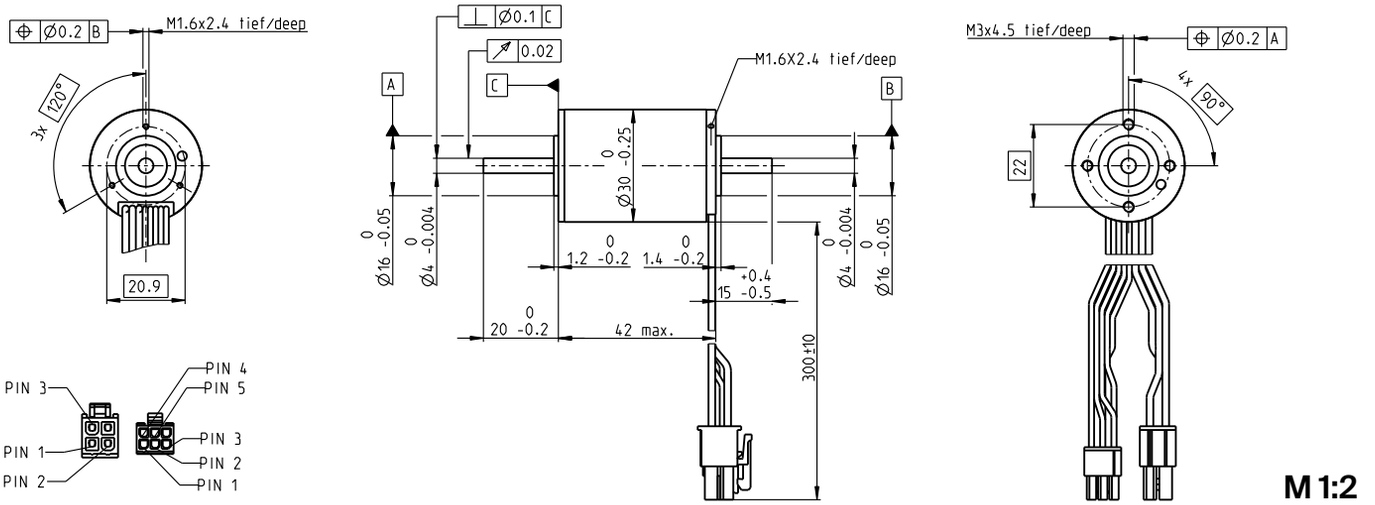
Recommended Electronics:

Notes	Page 36
ESCON Module 24/2	486
ESCON 36/3 EC	487
ESCON Mod. 50/4 EC-S	487
ESCON Module 50/5	487
ESCON 50/5	489
DEC Module 24/2	491
DEC Module 50/5	491
EPOS4 Micro 24/5	495
EPOS4 Mod./Comp. 24/1.5	496
EPOS4 Mod./Comp. 50/5	496
EPOS4 Comp. 24/5 3-axes	497
EPOS4 50/5	501
EPOS2 P 24/5	504

Encoder MR
128/256/512 CPT,
2/3 channels
Page 462

Brake AB 20
24 VDC
0.1 Nm
Page 516

EC-max 30 ∅30 mm, brushless, 40 Watt



Stock program
Standard program
Special program (on request)

Part Numbers

	272766	272768	272769	272770
Motor Data				
Values at nominal voltage				
1 Nominal voltage V	12	24	36	48
2 No load speed rpm	8680	9250	9150	9250
3 No load current mA	223	123	80.5	61.4
4 Nominal speed rpm	6630	7220	7090	7210
5 Nominal torque (max. continuous torque) mNm	34.9	33.8	33.3	33.4
6 Nominal current (max. continuous current) A	2.88	1.49	0.97	0.738
7 Stall torque mNm	153	160	154	157
8 Stall current A	11.8	6.57	4.18	3.24
9 Max. efficiency %	75	75	75	75
Characteristics				
10 Terminal resistance phase to phase Ω	1.01	3.65	8.61	14.8
11 Terminal inductance phase to phase mH	0.088	0.31	0.713	1.24
12 Torque constant mNm/A	12.9	24.3	36.8	48.6
13 Speed constant rpm/V	738	393	259	197
14 Speed/torque gradient rpm/mNm	57.8	59.1	60.6	59.9
15 Mechanical time constant ms	6.66	6.81	6.98	6.9
16 Rotor inertia gcm²	11	11	11	11

Specifications

Thermal data

17	Thermal resistance housing-ambient	8.6 K/W
18	Thermal resistance winding-housing	1 K/W
19	Thermal time constant winding	3.25 s
20	Thermal time constant motor	777 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+155°C

Mechanical data (preloaded ball bearings)

23	Max. speed		15000 rpm
24	Axial play at axial load	< 6.0 N	0 mm
		> 6.0 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		5 N
27	Max. force for press fits (static)		98 N
	(static, shaft supported)		2000 N
28	Max. radial load, 5 mm from flange		25 N

Other specifications

29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	195 g

Values listed in the table are nominal.

Connection motor (Cable AWG 20)

red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

Connector **Part number**
Molex 39-01-2040

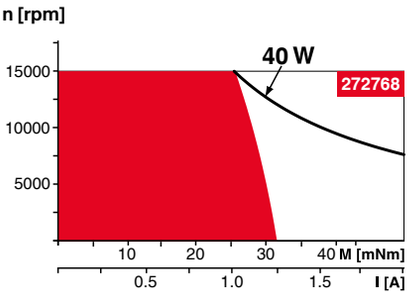
Connection sensors (Cable AWG 26)

yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V_{Hall} 3...24 VDC	Pin 5
	N.C.	Pin 6

Connector **Part number**
Molex 430-25-0600

Wiring diagram for Hall sensors see p. 47

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

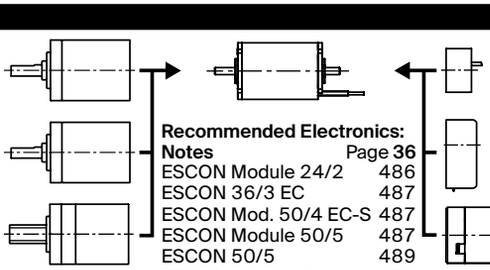
maxon Modular System

Details on catalog page 36

Planetary Gearhead
∅32 mm
1.0 - 8.0 Nm
Page 388/391

Koaxdrive
∅32 mm
1.0 - 4.5 Nm
Page 394

Screw Drive
∅32 mm
Page 416–421



Recommended Electronics:

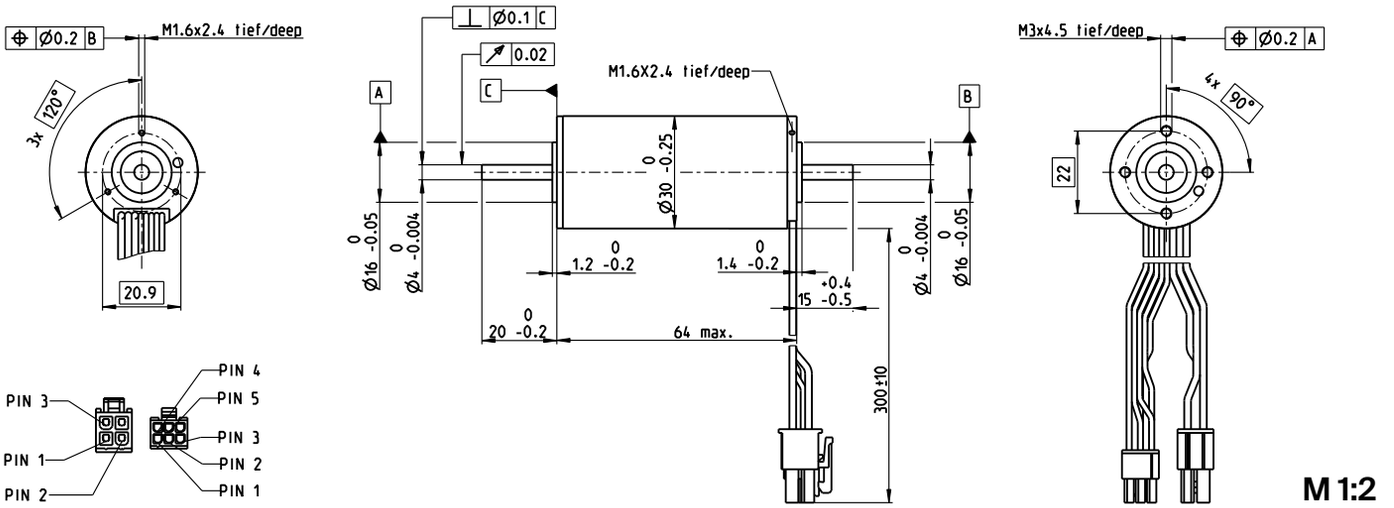
Notes	Page 36
ESCON Module 24/2	486
ESCON 36/3 EC	487
ESCON Mod. 50/4 EC-S	487
ESCON Module 50/5	487
ESCON 50/5	489
DEC Module 24/2	491
DEC Module 50/5	491
EPOS4 Micro 24/5	495
EPOS4 Mod./Comp. 50/5	496
EPOS4 Mod./Comp. 24/1.5	496
EPOS4 Comp. 24/5 3-axes	497
EPOS4 50/5	501
EPOS2 P 24/5	504

Encoder MR
500/1000 CPT,
3 channels
Page 463

Encoder HEDL 5540
500 CPT,
3 channels
Page 475

Brake AB 20
24 VDC
0.1 Nm
Page 516

EC-max 30 ∅30 mm, brushless, 60 Watt



EC-max

Stock program
Standard program
Special program (on request)

Part Numbers

	272762	272763	272764	272765
Motor Data				
Values at nominal voltage				
1 Nominal voltage V	12	24	36	48
2 No load speed rpm	7980	9340	9490	9350
3 No load current mA	302	191	130	95.4
4 Nominal speed rpm	6590	8040	8270	8130
5 Nominal torque (max. continuous torque) mNm	63.6	60.7	63.7	64.1
6 Nominal current (max. continuous current) A	4.72	2.66	1.88	1.4
7 Stall torque mNm	381	458	522	519
8 Stall current A	26.8	18.8	14.5	10.7
9 Max. efficiency %	80	81	82	82
Characteristics				
10 Terminal resistance phase to phase Ω	0.447	1.27	2.48	4.49
11 Terminal inductance phase to phase mH	0.049	0.143	0.312	0.573
12 Torque constant mNm/A	14.2	24.3	35.9	48.6
13 Speed constant rpm/V	672	393	266	197
14 Speed/torque gradient rpm/mNm	21.2	20.6	18.4	18.2
15 Mechanical time constant ms	4.86	4.73	4.21	4.17
16 Rotor inertia gcm^2	21.9	21.9	21.9	21.9

Specifications

Thermal data

17	Thermal resistance housing-ambient	7.4 K/W
18	Thermal resistance winding-housing	0.5 K/W
19	Thermal time constant winding	2.76 s
20	Thermal time constant motor	1000 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+155°C

Mechanical data (preloaded ball bearings)

23	Max. speed		15000 rpm
24	Axial play at axial load	< 6.0 N	0 mm
		> 6.0 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		5 N
27	Max. force for press fits (static)		98 N
	(static, shaft supported)		1300 N
28	Max. radial load, 5 mm from flange		25 N

Other specifications

29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	305 g

Values listed in the table are nominal.

Connection motor (Cable AWG 20)

red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

Connector	**Part number**
Molex	39-01-2040

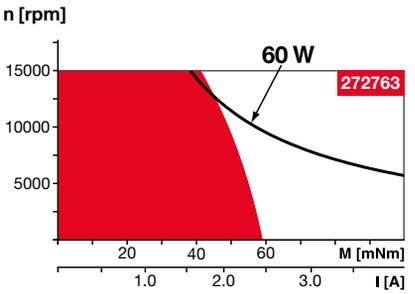
Connection sensors (Cable AWG 26)

yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V_{Hall} 3...24 VDC	Pin 5
	N.C.	Pin 6

Connector	**Part number**
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 47

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

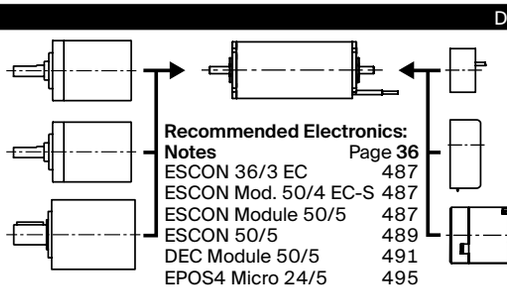
maxon Modular System

Details on catalog page 36

Planetary Gearhead
∅32 mm
1.0 - 8.0 Nm
Page 388/391

Koaxdrive
∅32 mm
1.0 - 4.5 Nm
Page 394

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 397



Recommended Electronics:

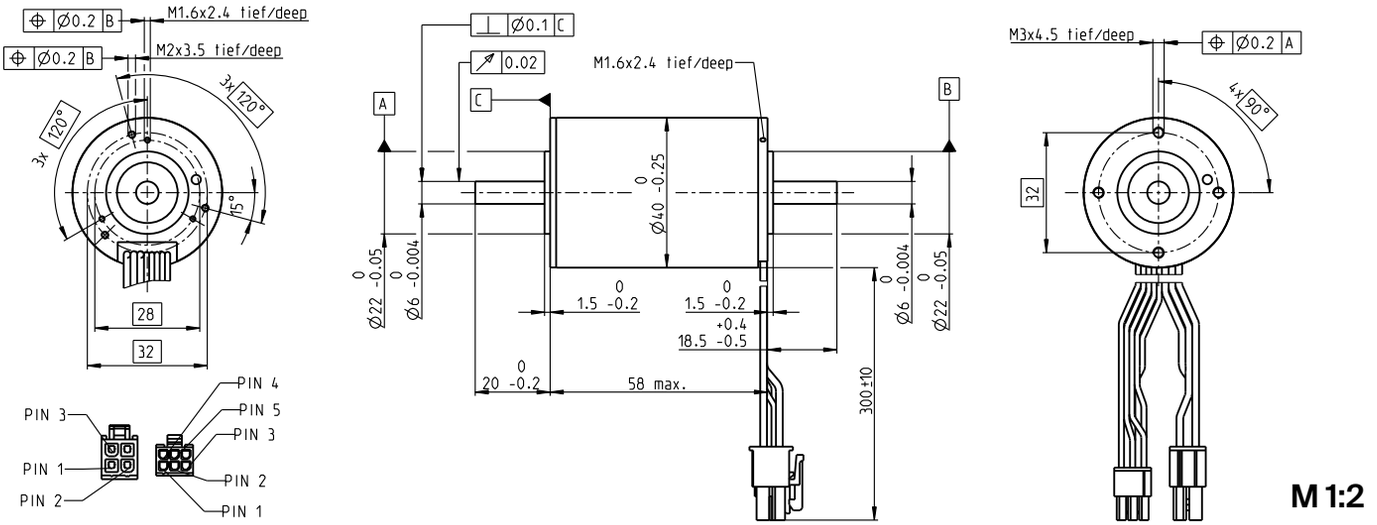
Notes	Page **36**
ESCON 36/3 EC	487
ESCON Mod. 50/4 EC-S	487
ESCON Module 50/5	487
ESCON 50/5	489
DEC Module 50/5	491
EPOS4 Micro 24/5	495
EPOS4 Mod./Comp. 50/5	496
EPOS4 Comp. 24/5 3-axes	497
EPOS4 50/5	501
EPOS2 P 24/5	504

Encoder MR
500/1000 CPT,
3 channels
Page 463

Encoder HEDL 5540
500 CPT,
3 channels
Page 475

Brake AB 20
24 VDC
0.1 Nm
Page 516

EC-max 40 ∅40 mm, brushless, 70 Watt



Stock program
Standard program
Special program (on request)

Part Numbers

	283866	283867	283868	283869
Motor Data				
Values at nominal voltage				
1 Nominal voltage V	12	24	36	48
2 No load speed rpm	8030	8040	8470	9030
3 No load current mA	584	292	209	173
4 Nominal speed rpm	6410	6520	7030	7610
5 Nominal torque (max. continuous torque) mNm	89.7	89.6	95	94.2
6 Nominal current (max. continuous current) A	6.88	3.44	2.55	2.02
7 Stall torque mNm	466	497	595	636
8 Stall current A	33.3	17.8	14.9	12.7
9 Max. efficiency %	76	77	78	79
Characteristics				
10 Terminal resistance phase to phase Ω	0.36	1.35	2.42	3.78
11 Terminal inductance phase to phase mH	0.0464	0.186	0.379	0.592
12 Torque constant mNm/A	14	28	40	50
13 Speed constant rpm/V	682	341	239	191
14 Speed/torque gradient rpm/mNm	17.6	16.5	14.4	14.4
15 Mechanical time constant ms	9.41	8.82	7.74	7.73
16 Rotor inertia gcm²	51.2	51.2	51.2	51.2

Specifications

Thermal data

17	Thermal resistance housing-ambient	4.63 K/W
18	Thermal resistance winding-housing	0.542 K/W
19	Thermal time constant winding	3.78 s
20	Thermal time constant motor	1060 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+155°C

Mechanical data (preloaded ball bearings)

23	Max. speed		12000 rpm
24	Axial play at axial load	< 10 N	0 mm
		> 10 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		8 N
27	Max. force for press fits (static)		211 N
	(static, shaft supported)		5000 N
28	Max. radial load, 5 mm from flange		80 N

Other specifications

29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	460 g

Values listed in the table are nominal.

Connection motor (Cable AWG 20)

red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

Connector	**Part number**
Molex	39-01-2040

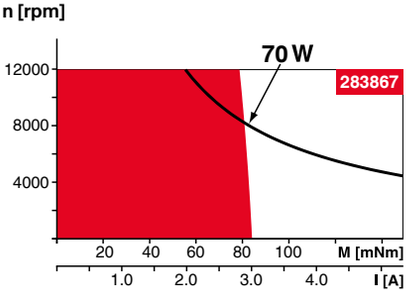
Connection sensor (Cable AWG 26)

yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V_{Hall} 3...24 VDC	Pin 5
	N.C.	Pin 6

Connector	**Part number**
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 47

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

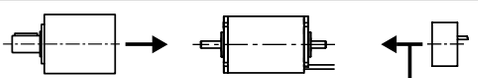
Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 36

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 397



Recommended Electronics:

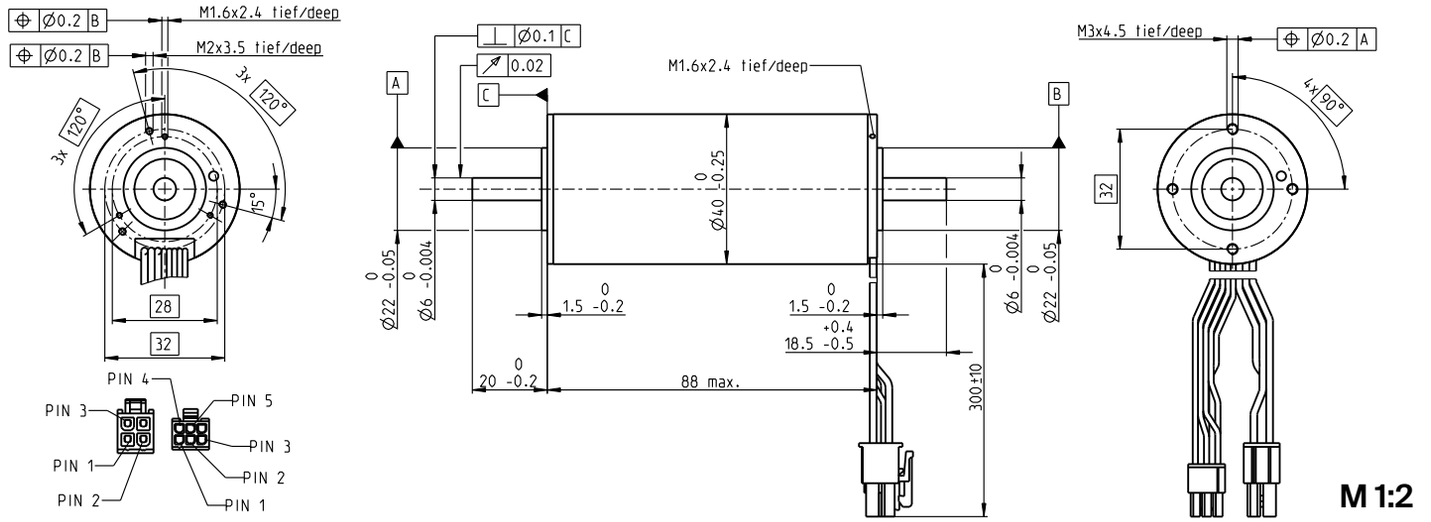
Notes	Page **36**
ESCON 36/3 EC	487
ESCON Module 50/5	487
ESCON Mod. 50/4 EC-S	487
ESCON Mod. 50/8 (HE)	488
ESCON 50/5	489
ESCON 70/10	489
DEC Module 50/5	491
EPOS4 Micro 24/5	495
EPOS4 Mod./Comp. 50/5	496
EPOS4 Comp. 24/5 3-axes	497
EPOS4 Mod./Comp. 50/8	497
EPOS4 50/5	501
EPOS4 70/15	501
EPOS2 P 24/5	504

Encoder MR
256 - 1024 CPT,
3 channels
Page 464

Encoder HEDL 5540
500 CPT,
3 channels
Page 475

Brake AB 28
24 VDC
0.4 Nm
Page 518

EC-max 40 ∅40 mm, brushless, 120 Watt



Stock program
Standard program
Special program (on request)

Part Numbers

	283870	283871	283872	283873
Motor Data				
Values at nominal voltage				
1 Nominal voltage V	48	48	48	48
2 No load speed rpm	10100	7240	4720	3610
3 No load current mA	310	188	104	72.8
4 Nominal speed rpm	9250	6280	3770	2670
5 Nominal torque (max. continuous torque) mNm	170	185	203	211
6 Nominal current (max. continuous current) A	4.06	3.1	2.19	1.74
7 Stall torque mNm	2090	1490	1050	838
8 Stall current A	46.7	23.7	10.9	6.68
9 Max. efficiency %	85	83	82	80
Characteristics				
10 Terminal resistance phase to phase Ω	1.03	2.02	4.4	7.19
11 Terminal inductance phase to phase mH	0.204	0.4	0.937	1.6
12 Torque constant mNm/A	44.8	62.8	96.1	126
13 Speed constant rpm/V	213	152	99.4	76.1
14 Speed/torque gradient rpm/mNm	4.89	4.9	4.55	4.35
15 Mechanical time constant ms	5.17	5.19	4.81	4.61
16 Rotor inertia gcm²	101	101	101	101

Specifications

Thermal data

17	Thermal resistance housing-ambient	3.45 K/W
18	Thermal resistance winding-housing	0.29 K/W
19	Thermal time constant winding	3.96 s
20	Thermal time constant motor	1240 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+155°C

Mechanical data (preloaded ball bearings)

23	Max. speed		12000 rpm
24	Axial play at axial load	< 10 N	0 mm
		> 10 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		8 N
27	Max. force for press fits (static)		211 N
	(static, shaft supported)		4000 N
28	Max. radial load, 5 mm from flange		80 N

Other specifications

29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	720 g

Values listed in the table are nominal.

Connection motor (Cable AWG 20)

red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

Connector	**Part number**
Molex	39-01-2040

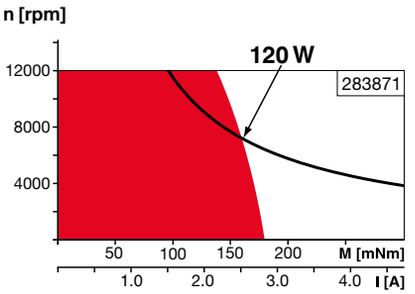
Connection sensors (Cable AWG 26)

yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V_{Hall} 3...24 VDC	Pin 5
	N.C.	Pin 6

Connector	**Part number**
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 47

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

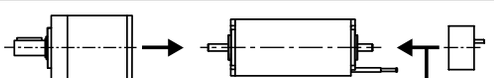
Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 36

Planetary Gearhead
∅52 mm
4 - 30 Nm
Page 402



Recommended Electronics:

Notes	Page **36**
ESCON Module 50/5	487
ESCON Mod. 50/4 EC-S	487
ESCON 50/5	489
ESCON 70/10	489
DEC Module 50/5	491
EPOS4 Mod./Comp. 50/5	496
EPOS4 Module 50/8	497
EPOS4 Comp. 50/8 CAN	499
EPOS4 50/5	501
EPOS2 P 24/5	504

Encoder MR
256 - 1024 CPT,
3 channels
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Encoder HEDL 5540
500 CPT,
3 channels
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Brake AB 28
24 VDC
0.4 Nm
Page 518

For your personal notes

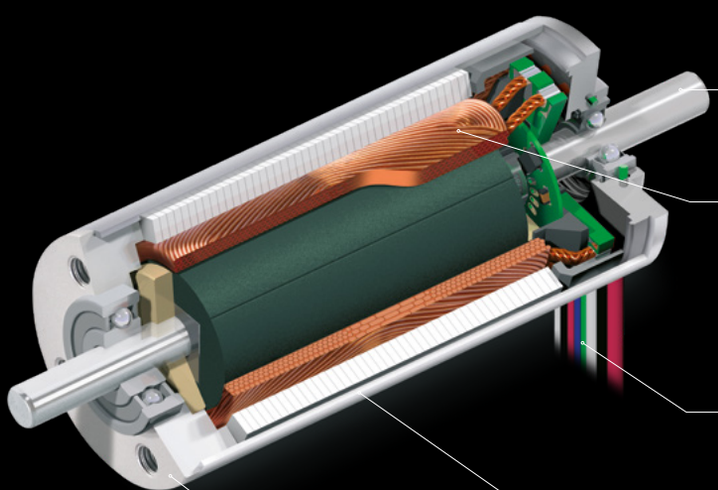
maxon EC-4pole

maxon EC-4pole

∅30 mm, 200 W. That is top performance. Their special winding technology and 4-pole magnets make maxon's brushless EC-4-pole drives unbeatable when it comes to delivering the highest driving power per unit of volume and weight. The motors feature a no cogging torque, high efficiency, and excellent control dynamics. The metal housing ensures good heat dissipation and mechanical stability. When it comes to service life, these drives leave the competition far behind.

Key data

Motor ∅	22 ... 32 mm
Motor length	47 ... 162 mm
Power	90 ... 480 W
Nominal torque	up to 800 mNm
Max. permissible speed	up to 25 000 rpm



Grooveless shaft ensures smooth running and extremely high torsional rigidity.

The centerpiece is the ironless maxon winding. Its physical design offer benefits such as: zero cogging torque, high efficiency and excellent control dynamics.

Strain-relieved cables can be routed away from the motor both radially and axially. Connectors are possible.

The motor housing is a steel tube – non-magnetic, rigid, stainless.

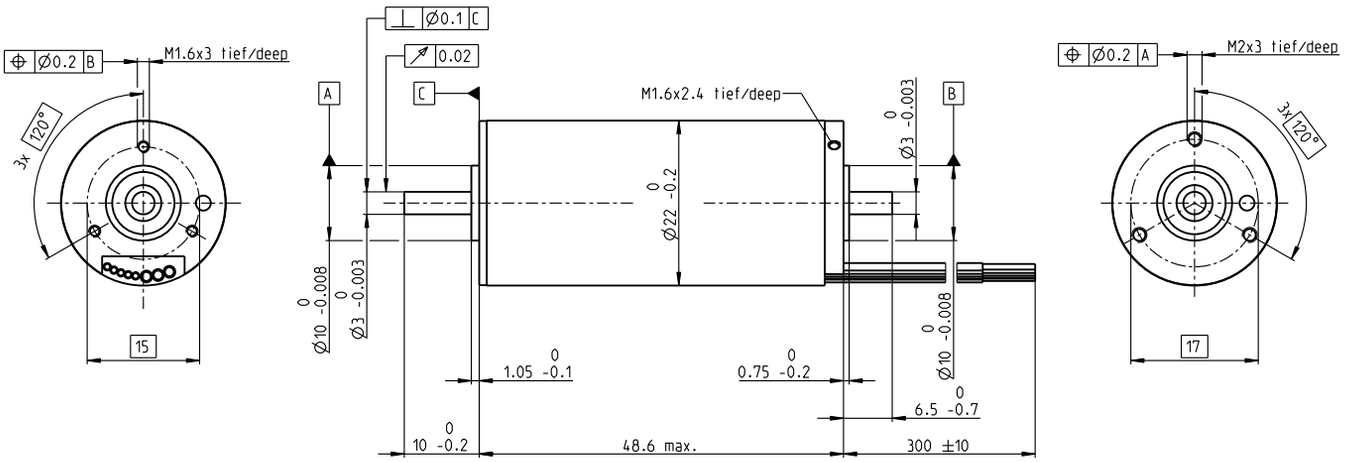
The metal housing and flange ensure good heat dissipation and mechanical stability.

- → Maximum power density due to rotors with two pole pairs
- → maxon winding with optimized interconnection of the partial windings
- → Speeds up to 25 000 rpm
- → High-quality magnetic return material to reduce eddy current losses
- → "Heavy Duty" version for extreme environmental conditions

shop.maxongroup.com

EC-4pole 22 ∅22 mm, brushless, 90 Watt

High Power



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers	323217	323218	323219	323220	327739
Motor Data					
Values at nominal voltage					
1 Nominal voltage V	18	24	36	48	48
2 No load speed rpm	16300	16300	16300	16300	6900
3 No load current mA	218	164	109	81.8	20.7
4 Nominal speed rpm	14900	15000	14900	14900	5550
5 Nominal torque (max. continuous torque) mNm	43.7	45.1	43.7	42.6	43.9
6 Nominal current (max. continuous current) A	4.32	3.34	2.16	1.58	0.679
7 Stall torque mNm	588	639	612	586	234
8 Stall current A	55.8	45.5	29.1	20.9	3.55
9 Max. efficiency %	88	89	88	88	85
Characteristics					
10 Terminal resistance phase to phase Ω	0.323	0.527	1.24	2.3	13.5
11 Terminal inductance phase to phase mH	0.0283	0.0503	0.113	0.201	1.11
12 Torque constant mNm/A	10.5	14	21.1	28.1	66
13 Speed constant rpm/V	907	680	453	340	145
14 Speed/torque gradient rpm/mNm	27.8	25.5	26.7	27.9	29.7
15 Mechanical time constant ms	1.61	1.48	1.55	1.62	1.72
16 Rotor inertia gcm^2	5.54	5.54	5.54	5.54	5.54

Specifications

Thermal data

17	Thermal resistance housing-ambient	12.2 K/W
18	Thermal resistance winding-housing	1.19 K/W
19	Thermal time constant winding	5.12 s
20	Thermal time constant motor	482 s
21	Ambient temperature	-20...+100°C
22	Max. winding temperature	+155°C

Mechanical data (preloaded ball bearings)

23	Max. speed		25000 rpm
24	Axial play at axial load	< 3.0 N	0 mm
		> 3.0 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		4 N
27	Max. force for press fits (static)		53 N
	(static, shaft supported)		1000 N
28	Max. radial load, 5 mm from flange		16 N

Other specifications

29	Number of pole pairs	2
30	Number of phases	3
31	Weight of motor	125 g

Values listed in the table are nominal.

Connection motor (Cable AWG 20)

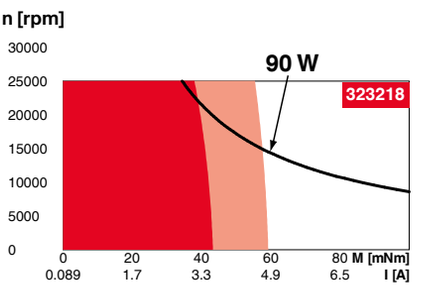
red	Motor winding 1
white	Motor winding 3
black	Motor winding 2

Connection sensors (Cable AWG 26)

red/grey	Hall sensor 1
black/grey	Hall sensor 2
white/grey	Hall sensor 3
green	V_{Hall} 3...24 VDC
blue	GND

Wiring diagram for Hall sensors see p. 47

Operating Range



Continuous operation
Continuous operation with reduced thermal resistance R_{th2} 50%
Intermittent operation

Assigned power rating

Comments

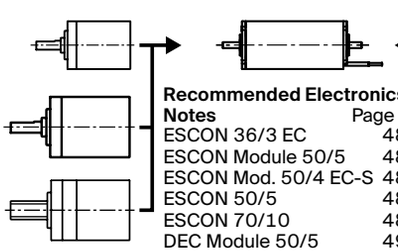
maxon Modular System

Details on catalog page 36

Planetary Gearhead
∅22 mm
2.0 - 3.4 Nm
Page 378

Planetary Gearhead
∅32 mm
1.0 - 6.0 Nm
Page 388

Screw Drive
∅32 mm
Page 416–421



Recommended Electronics:

Notes	Page 27
ESCON 36/3 EC	487
ESCON Module 50/5	487
ESCON Mod. 50/4 EC-S	487
ESCON 50/5	489
ESCON 70/10	489
DEC Module 50/5	491
EPOS4 Micro 24/5	495
EPOS4 Mod./Comp. 50/5	496
EPOS4 Comp. 24/5 3-axes	497
EPOS4 50/5	501
EPOS2 P 24/5	504

Encoder 16 EASY
128 - 1024 CPT, 3 channels
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Encoder 16 EASY XT
128 - 1024 CPT, 3 channels
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Encoder 16 EASY Absolute
4096 steps, Single Turn
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Encoder 16 EASY Absolute XT
4096 steps, Single Turn
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Encoder 16 RIO
1024 - 32768 CPT, 3 channels
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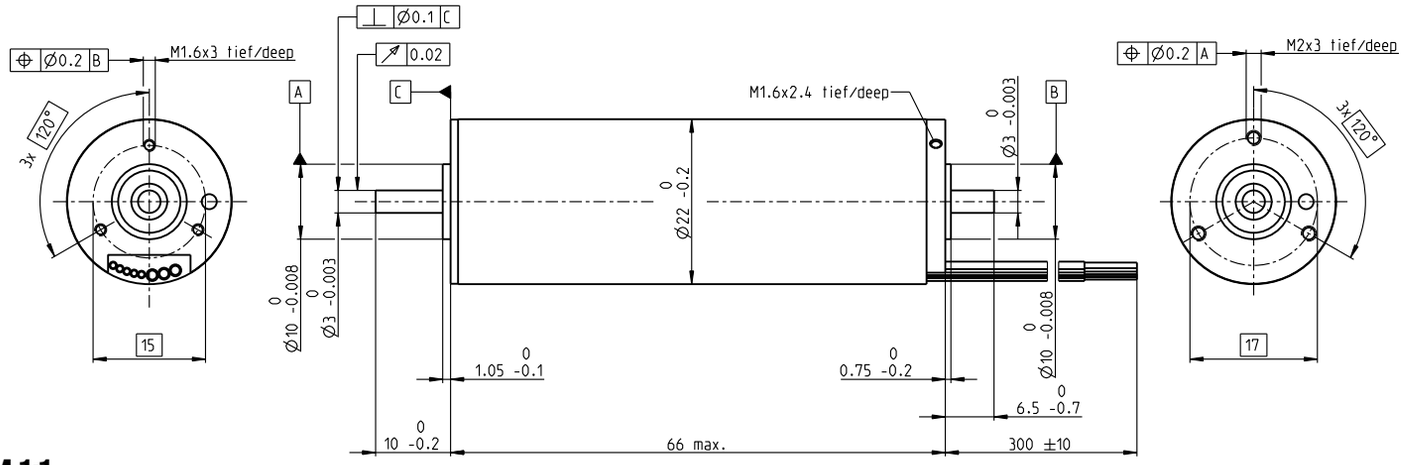
Encoder AEDL 5810
1024 - 5000 CPT, 3 channels
Page 469

Encoder HEDL 5540
500 CPT, 3 channels
Page 475

EC-4pole 22 ∅22 mm, brushless, 120 Watt

High Power



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

	311535	311536	311537	311538
Motor Data				
Values at nominal voltage				
1 Nominal voltage V	18	24	36	48
2 No load speed rpm	16800	16900	17800	16900
3 No load current mA	298	223	166	112
4 Nominal speed rpm	15700	15800	16800	15800
5 Nominal torque (max. continuous torque) mNm	54	54.6	54	54.5
6 Nominal current (max. continuous current) A	5.55	4.21	2.95	2.1
7 Stall torque mNm	874	954	1090	1020
8 Stall current A	86	70.4	56.8	37.7
9 Max. efficiency %	89	89	90	90
Characteristics				
10 Terminal resistance phase to phase Ω	0.209	0.341	0.634	1.27
11 Terminal inductance phase to phase mH	0.017	0.031	0.062	0.123
12 Torque constant mNm/A	10.2	13.5	19.2	27.1
13 Speed constant rpm/V	940	705	497	352
14 Speed/torque gradient rpm/mNm	19.4	17.7	16.4	16.6
15 Mechanical time constant ms	1.81	1.65	1.53	1.54
16 Rotor inertia gcm²	8.91	8.91	8.91	8.91

Specifications

Thermal data

17	Thermal resistance housing-ambient	10.7 K/W
18	Thermal resistance winding-housing	0.7 K/W
19	Thermal time constant winding	4.66 s
20	Thermal time constant motor	936 s
21	Ambient temperature	-20...+100°C
22	Max. winding temperature	+155°C

Mechanical data (preloaded ball bearings)

23	Max. speed		25000 rpm
24	Axial play at axial load	< 3.0 N	0 mm
		> 3.0 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		4 N
27	Max. force for press fits (static)		53 N
	(static, shaft supported)		600 N
28	Max. radial load, 5 mm from flange		16 N

Other specifications

29	Number of pole pairs	2
30	Number of phases	3
31	Weight of motor	175 g

Values listed in the table are nominal.

Connection motor (Cable AWG 20)

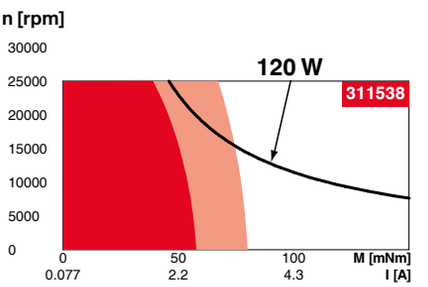
red	Motor winding 1
white	Motor winding 3
black	Motor winding 2

Connection sensors (Cable AWG 26)

red/grey	Hall sensor 1
black/grey	Hall sensor 2
white/grey	Hall sensor 3
green	V_{Hall} 3...24 VDC
blue	GND

Wiring diagram for Hall sensors see p. 47

Operating Range



Comments

Continuous operation
Continuous operation with reduced thermal resistance R_{th2} 50%
Intermittent operation

Assigned power rating

maxon Modular System

Details on catalog page 36

Planetary Gearhead
∅22 mm
2.0 - 3.4 Nm
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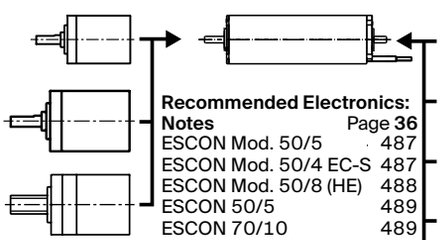
Planetary Gearhead
∅32 mm
1.0 - 6.0 Nm
Page 388

Screw Drive
∅32 mm
Page 416–421



Recommended Electronics:

Notes	Page 36
ESCON Mod. 50/5	487
ESCON Mod. 50/4 EC-S	487
ESCON Mod. 50/8 (HE)	488
ESCON 50/5	489
ESCON 70/10	489
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EPOS4 Micro 24/5	495
EPOS4 Mod./Comp. 50/5	496
EPOS4 Comp. 24/5 3-axes	497
EPOS4 50/5	501
EPOS2 P 24/5	504

Encoder 16 EASY
128 - 1024 CPT, 3 channels
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Encoder 16 EASY XT
128 - 1024 CPT, 3 channels
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Encoder 16 EASY Absolute
4096 steps, Single Turn
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Encoder 16 EASY Absolute XT
4096 steps, Single Turn
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Encoder 16 RIO
1024 - 32768 CPT, 3 channels
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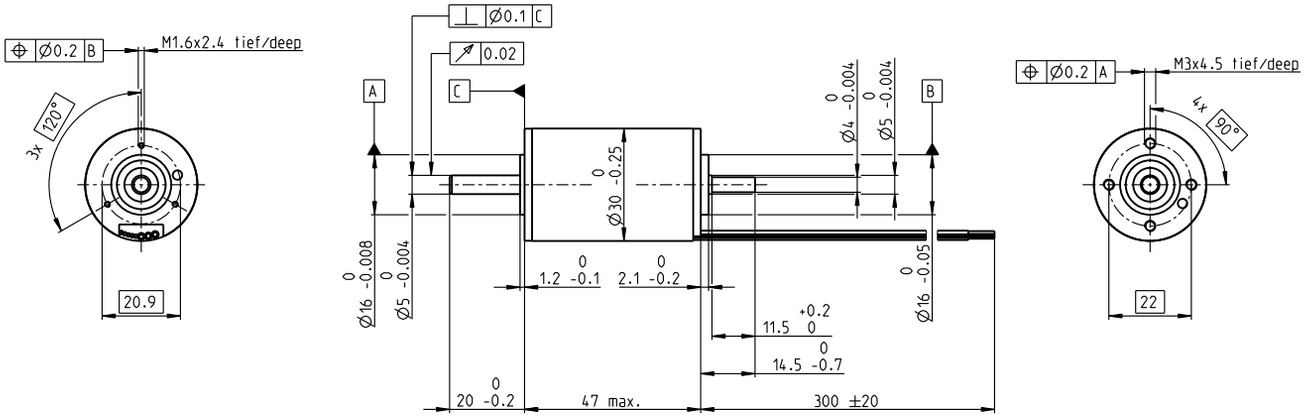
Encoder AEDL 5810
1024 - 5000 CPT, 3 channels
Page 469

Encoder HEDL 5540
500 CPT, 3 channels
Page 475

EC-4pole 30 ∅30 mm, brushless, 100 Watt

High Power



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

	309755	309756	309757	309758
Motor Data				
Values at nominal voltage				
1 Nominal voltage V	18	24	36	48
2 No load speed rpm	17500	17500	17500	17500
3 No load current mA	505	379	253	189
4 Nominal speed rpm	16300	16300	16400	16400
5 Nominal torque (max. continuous torque) mNm	72	68.8	74.3	73.4
6 Nominal current (max. continuous current) A	7.74	5.56	3.98	2.95
7 Stall torque mNm	1310	1270	1510	1500
8 Stall current A	133	96.9	77.2	57.4
9 Max. efficiency %	88.3	88.2	89.1	89.1
Characteristics				
10 Terminal resistance phase to phase Ω	0.135	0.248	0.466	0.836
11 Terminal inductance phase to phase mH	0.0166	0.0295	0.0664	0.118
12 Torque constant mNm/A	9.8	13.1	19.6	26.1
13 Speed constant rpm/V	974	731	487	365
14 Speed/torque gradient rpm/mNm	13.4	13.9	11.6	11.7
15 Mechanical time constant ms	2.57	2.65	2.22	2.24
16 Rotor inertia gcm²	18.3	18.3	18.3	18.3

Specifications

Thermal data

17	Thermal resistance housing-ambient	8.96 K/W
18	Thermal resistance winding-housing	0.74 K/W
19	Thermal time constant winding	4.12 s
20	Thermal time constant motor	968 s
21	Ambient temperature	-20...+100°C
22	Max. winding temperature	+155°C

Mechanical data (preloaded ball bearings)

23	Max. speed		25000 rpm
24	Axial play at axial load	< 4.0 N	0 mm
		> 4.0 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		5.5 N
27	Max. force for press fits (static)		73 N
	(static, shaft supported)		2000 N
28	Max. radial load, 5 mm from flange		25 N

Other specifications

29	Number of pole pairs	2
30	Number of phases	3
31	Weight of motor	210 g

Values listed in the table are nominal.

Connection motor (Cable AWG 18)

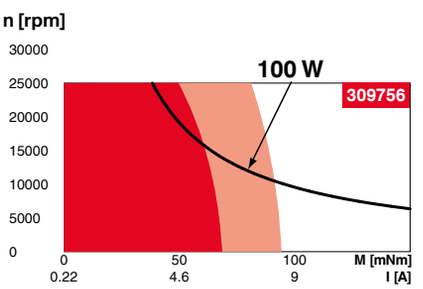
black	Motor winding 2
white	Motor winding 3
red	Motor winding 1

Connection sensors (Cable AWG 26)

black/grey	Hall sensor 2
blue	GND
green	V_{Hall} 3...24 VDC
red/grey	Hall sensor 1
white/grey	Hall sensor 3

Wiring diagram for Hall sensors see p. 47

Operating Range



Continuous operation
Continuous operation with reduced thermal resistance R_{th2} 50%
Intermittent operation

Assigned power rating

Comments

maxon Modular System

Details on catalog page 36

Planetary Gearhead
∅32 mm
4 - 8 Nm
Page 391

Planetary Gearhead
∅42 mm
3 - 15 Nm
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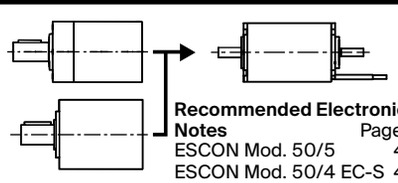

Recommended Electronics:

Notes	Page 36
ESCON Mod. 50/5	487
ESCON Mod. 50/4 EC-S	487
ESCON Mod. 50/8 (HE)	488
ESCON 50/5	489
ESCON 70/10	489
DEC Module 50/5	491
EPOS4 Mod./Comp. 50/5	496
EPOS4 Module 50/8	497
EPOS4 Comp. 50/8 CAN	499
EPOS4 50/5	501
EPOS4 70/15	501

Encoder 16 EASY/XT
128 - 1024 CPT, 3 channels
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Encoder 16 EASY Absolute/XT
4096 steps, Single Turn
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Encoder 16 RIO
1024 - 32768 CPT, 3 channels
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Encoder AEDL 5810
1024 - 5000 CPT, 3 channels
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Encoder HEDL 5540
500 CPT, 3 channels
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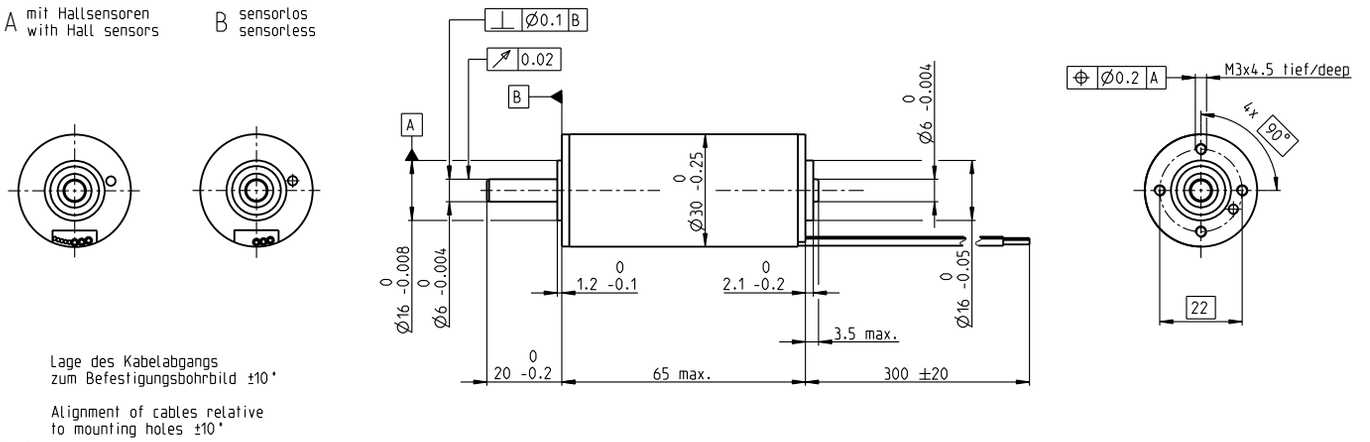
Brake AB 20
24 VDC, 0.1 Nm
Page 516

EC-4pole 30 ∅30 mm, brushless, 150 Watt

Sterilizable



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers		
A with Hall sensors	468311	468313
B sensorless	468312	468314

Motor Data (provisional)			
	Values at nominal voltage		
1	Nominal voltage	V	24	32
2	No load speed	rpm	17100	13100
3	No load current	mA	944	429
4	Nominal speed	rpm	16600	12400
5	Nominal torque (max. continuous torque)	mNm	84.6	106
6	Nominal current (max. continuous current)	A	7.23	4.9
7	Stall torque	mNm	3140	2320
8	Stall current	A	236	99.7
9	Max. efficiency	%	88	88
	Characteristics		
10	Terminal resistance phase to phase	Ω	0.102	0.321
11	Terminal inductance phase to phase	mH	0.016	0.049
12	Torque constant	mNm/A	13.3	23.3
13	Speed constant	rpm/V	718	410
14	Speed/torque gradient	rpm/mNm	5.49	5.66
15	Mechanical time constant	ms	2.02	2.09
16	Rotor inertia	gcm²	35.2	35.2

Specifications

Thermal data

17	Thermal resistance housing-ambient	7.4 K/W
18	Thermal resistance winding-housing	0.209 K/W
19	Thermal time constant winding	2.11 s
20	Thermal time constant motor	1180 s
21	Ambient temperature	-40...+150°C
22	Max. permissible winding temperature	155°C

Mechanical data (preloaded ball bearings)

23	Max. permissible speed	25000 rpm
24	Axial play at axial load < 4.0 N	0 mm
	> 4.0 N	0.14 mm
25	Radial play	preloaded
26	Max. axial load (dynamic)	5.5 N
27	Max. force for press fits (static)	73 N
	(static, shaft supported)	1300 N
28	Max. radial loading, 5 mm from flange	25 N

Other specifications

29	Number of pole pairs	2
30	Number of phases	3
31	Weight of motor	300 g

Values listed in the table are nominal.

Connection motor (Cable AWG 18)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

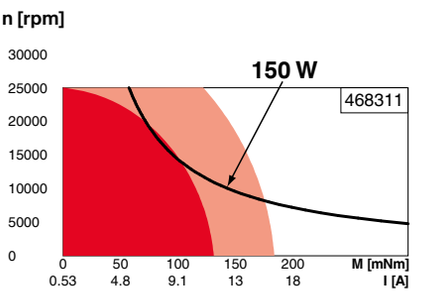
Connection sensors (Cable AWG 26)

green	VHall 3...24 VDC
blue	GND
red/grey	Hall sensor 1
black/grey	Hall sensor 2
white/grey	Hall sensor 3

Wiring diagram for Hall sensors see p. 47

Option
Hollow shaft with bore diameter up to 4.1 mm

Operating Range



Comments

Continuous operation
Continuous operation with reduced thermal resistance R_{th2} 50%
Intermittent operation

Assigned power rating

Application

Sterilizable Devices

- Orthopedic Drills
- Orthopedic Saws
- Surgical Reamers

Sterilization information

Sensorless: typically 2000 autoclave cycles
Hall sensor: typically 1000 autoclave cycles

Sterilization with steam

Temperature	+134°C ± 4°C
Compression pressure up to	2.3 bar
Rel. humidity	100%
Cycle length	18 minutes

maxon Modular System

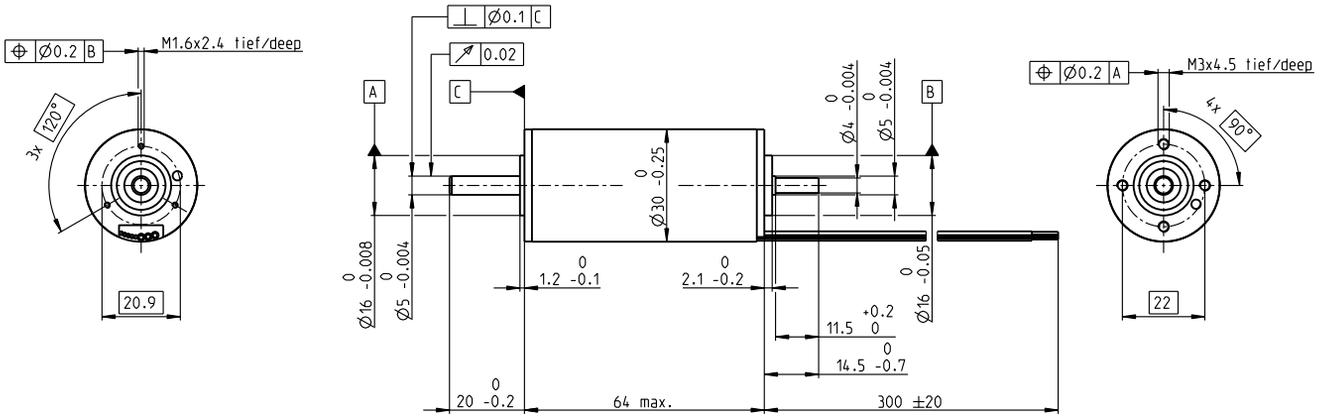
Details on catalog page 36

Recommended Electronics:

Notes	Page **36**
ESCON Mod. 50/5	487
ESCON Mod. 50/4 EC-S	487
ESCON Mod. 50/8 (HE)	488
ESCON 50/5	489
ESCON 70/10	489
DEC Module 50/5	491

EC-4pole 30 ∅30 mm, brushless, 200 Watt

High Power



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

	305013	305014	305015
Motor Data			
Values at nominal voltage			
1 Nominal voltage V	24	36	48
2 No load speed rpm	16700	16700	16500
3 No load current mA	723	482	356
4 Nominal speed rpm	16100	16100	16000
5 Nominal torque (max. continuous torque) mNm	95.6	95.2	92.9
6 Nominal current (max. continuous current) A	7.61	5.06	3.68
7 Stall torque mNm	3240	3520	3430
8 Stall current A	236	171	124
9 Max. efficiency %	90	90	90
Characteristics			
10 Terminal resistance phase to phase Ω	0.102	0.21	0.386
11 Terminal inductance phase to phase mH	0.016	0.037	0.065
12 Torque constant mNm/A	13.7	20.6	27.6
13 Speed constant rpm/V	697	465	346
14 Speed/torque gradient rpm/mNm	5.17	4.75	4.83
15 Mechanical time constant ms	1.80	1.66	1.69
16 Rotor inertia gcm²	33.3	33.3	33.3

Specifications

Thermal data

17	Thermal resistance housing-ambient	7.4 K/W
18	Thermal resistance winding-housing	0.21 K/W
19	Thermal time constant winding	2.11 s
20	Thermal time constant motor	1180 s
21	Ambient temperature	-20...+100°C
22	Max. winding temperature	+155°C

Mechanical data (preloaded ball bearings)

23	Max. speed		25000 rpm
24	Axial play at axial load	< 4.0 N	0 mm
		> 4.0 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		5.5 N
27	Max. force for press fits (static)		73 N
	(static, shaft supported)		1300 N
28	Max. radial load, 5 mm from flange		25 N

Other specifications

29	Number of pole pairs	2
30	Number of phases	3
31	Weight of motor	300 g

Values listed in the table are nominal.

Connection motor (Cable AWG 18)

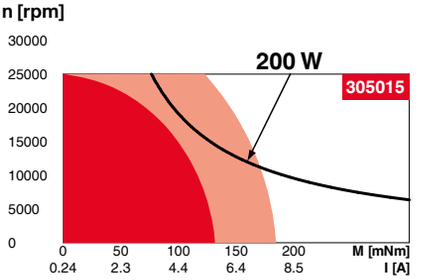
black	Motor winding 2
white	Motor winding 3
red	Motor winding 1

Connection sensors (Cable AWG 26)

black/grey	Hall sensor 2
blue	GND
green	V_{Hall} 3...24 VDC
red/grey	Hall sensor 1
white/grey	Hall sensor 3

Wiring diagram for Hall sensors see p. 47

Operating Range



Continuous operation
Continuous operation with reduced thermal resistance R_{th2} 50%
Intermittent operation

Assigned power rating

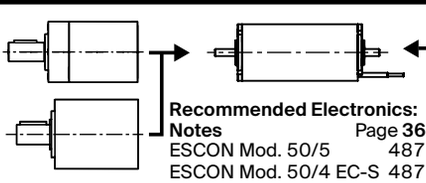
Comments

maxon Modular System

Details on catalog page 36

Planetary Gearhead
∅32 mm
4 - 8 Nm
Page 392

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 397–398



Recommended Electronics:

Notes	Page 36
ESCON Mod. 50/5	487
ESCON Mod. 50/4 EC-S	487
ESCON Mod. 50/8 (HE)	488
ESCON 50/5	489
ESCON 70/10	489
DEC Module 50/5	491
EPOS4 Mod./Comp. 50/5	496
EPOS4 Module 50/8	497
EPOS4 Comp. 50/8 CAN	499
EPOS4 50/5	501
EPOS4 70/15	501

Encoder 16 EASY/XT
128 - 1024 CPT, 3 channels
Page 449/451

Encoder 16 EASY Absolute/XT
4096 steps, Single Turn
Page 453/455

Encoder 16 RIO
1024 - 32768 CPT, 3 channels
Page 466

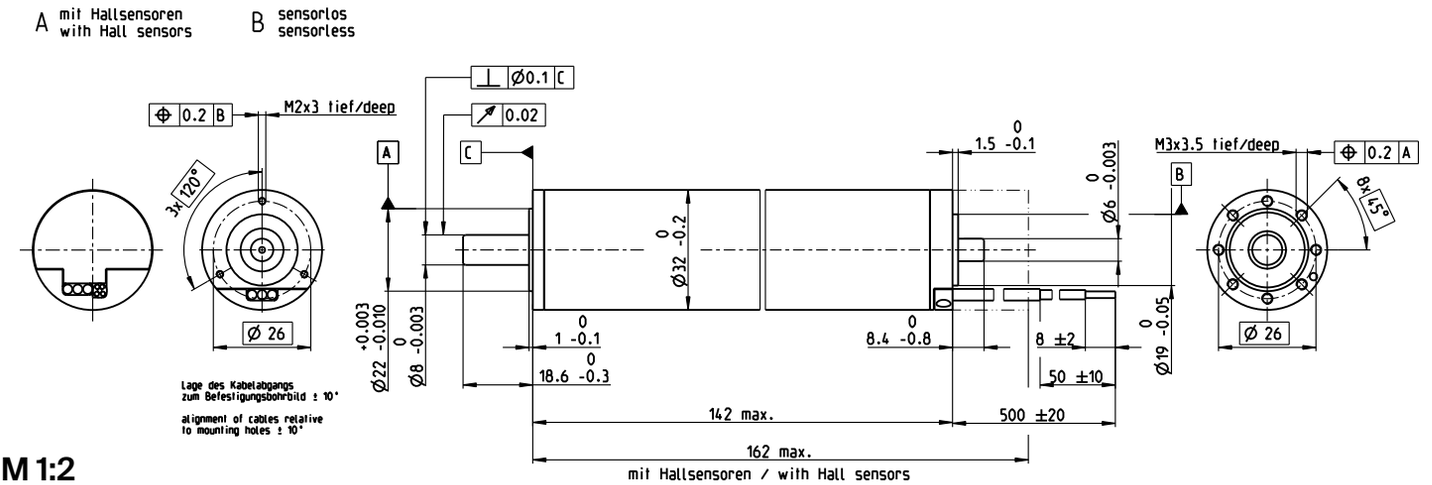
Encoder AEDL 5810
1024 - 5000 CPT, 3 channels
Page 469

Encoder HEDL 5540
500 CPT, 3 channels
Page 476

Brake AB 20
24 VDC, 0.1 Nm
Page 517

EC-4pole 32 ∅32 mm, brushless, 220 Watt

Heavy Duty – for applications in air



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers	
A with Hall sensors	397798
B sensorless	393879

Motor Data (provisional)						
Values at nominal voltage and ambient temperature °C		**25**	**100**	**150**	**200**	
1 Nominal voltage	V	48	48	48	48	
2 No load speed	rpm	6470	6650	6770	6890	
3 No load current	mA	149	113	109	107	
4 Nominal speed[1]	rpm	5710	5870	6080	6470	
5 Nominal torque (max. continuous torque)[1]	mNm	334	261	196	104	
6 Nominal current (max. continuous current)	A	4.87	3.85	2.98	1.67	
7 Stall torque	mNm	3350	2520	2150	1860	
8 Stall current	A	47.5	36.7	31.9	28.1	
9 Max. efficiency	%	89	89	89	88	
Characteristics						
10 Terminal resistance phase to phase	Ω	1.01	1.31	1.51	1.71	
11 Terminal inductance phase to phase	mH	0.298	0.298	0.298	0.298	
12 Torque constant	mNm/A	70.5	68.7	67.4	66.2	
13 Speed constant	rpm/V	135	139	142	144	
14 Speed / torque gradient	rpm/mNm	1.94	2.65	3.16	3.71	
15 Mechanical time constant	ms	2.6	3.55	4.24	4.98	
16 Rotor inertia	gcm²	128	128	128	128	

[1] Values for operation in thermal equilibrium.

Specifications

Thermal data

17	Thermal resistance housing-ambient	4 K/W
18	Thermal resistance winding-housing	0.53 K/W
19	Thermal time constant winding	17 s
20	Thermal time constant motor	1720 s
21	Ambient temperature	-55...+200°C
22	Max. winding temperature	+240°C

Mechanical data (preloaded ball bearings)

23	Max. speed	12000 rpm
24	Axial play at axial load < 20 N	0 mm
	> 20 N	0.14 mm
25	Radial play	preloaded
26	Max. axial load (dynamic)	16 N
27	Max. force for press fits (static)	80 N
	(static, shaft supported)	3000 N
28	Max. radial load, 5 mm from flange	75 N

Other specifications

29	Number of pole pairs	2
30	Number of phases	3
31	Weight of motor	860 g

Connection A, motor cable PTFE (AWG 14)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors cable PTFE (AWG 24)

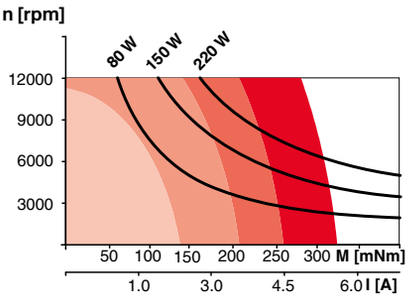
green	V_{Hall} 4.5...24 V
blue	GND
red	Hall sensor 1
black	Hall sensor 2
white	Hall sensor 3

Connection B, motor cable PTFE (AWG 14)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Wiring diagram for Hall sensors see p. 47

Operating Range



TA = 25°C
TA = 100°C
TA = 150°C
TA = 200°C

Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

Application

General
- extreme temperature applications
- vibration tested (according to MIL-STD810F/Jan2000 Fig. 514.5C-10)
- ultra-high vacuum applications (modifications necessary). low outgassing, can be baked out at 240°C

Aerospace
- gas turbine starter/generators for aircraft engines
- regulation of combustion engines

Oil & Gas Industry
- oil, gas and geothermal wells

Robotics
- robotic exploration vehicles

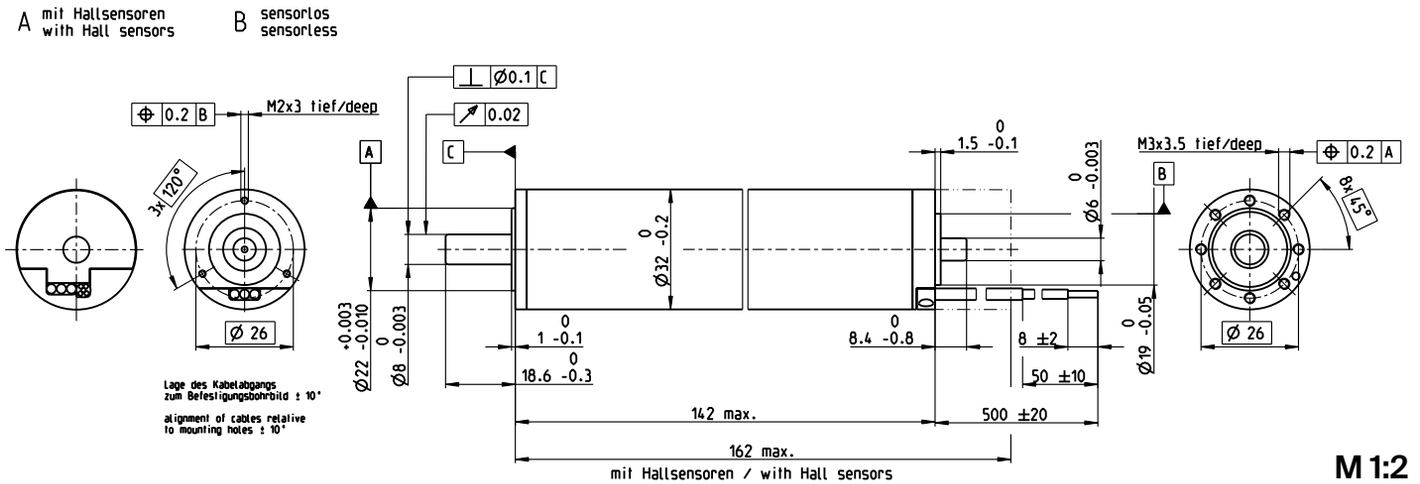
Industry
- pumps and valves for liquid metal cooling systems/turbine fuel and steam control
- valve adjustment for gas and steam power plants

Notice

This motor contains leaded solder. It therefore does not fulfill the requirements for the permitted maximum concentration of hazardous substances in accordance with the EC directive 2011/65/EC (RoHS) for all applications. The motor may therefore only be used for devices that are not subject to this directive.

EC-4pole 32 ∅32 mm, brushless, 480 Watt

Heavy Duty – for applications in oil



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers	
A with Hall sensors	397799
B sensorless	397800

Motor Data (provisional)						
Values at nominal voltage and ambient temperature °C		**25**	**100**	**150**	**200**	
1 Nominal voltage	V	48	48	48	48	
2 No load speed	rpm	6420	6630	6750	6860	
3 No load current	mA	482	222	212	216	
4 Nominal speed[1]	rpm	4670	4420	4700	5340	
5 Nominal torque (max. continuous torque)[1]	mNm	804	762	596	379	
6 Nominal current (max. continuous current)	A	11.4	10.9	8.75	5.78	
7 Stall torque	mNm	3350	2520	2150	1860	
8 Stall current	A	47.5	36.7	31.9	28.1	
9 Max. efficiency	%	82	85	85	84	
Characteristics						
10 Terminal resistance phase to phase	Ω	1.01	1.31	1.51	1.71	
11 Terminal inductance phase to phase	mH	0.298	0.298	0.298	0.298	
12 Torque constant	mNm/A	70.5	68.7	67.4	66.2	
13 Speed constant	rpm/V	135	139	142	144	
14 Speed / torque gradient	rpm/mNm	1.94	2.65	3.16	3.71	
15 Mechanical time constant	ms	2.85	3.88	4.64	5.45	
16 Rotor inertia	gcm²	140	140	140	140	

[1] Values for operation in thermal equilibrium.

Specifications

Thermal data

17	Thermal resistance housing-ambient	0.3 K/W
18	Thermal resistance winding-housing	0.53 K/W
19	Thermal time constant winding	17 s
20	Thermal time constant motor	129 s
21	Ambient temperature	-55...+200°C
22	Max. winding temperature	+240°C

Mechanical data (preloaded ball bearings)

23	Max. speed	12000 rpm
24	Axial play at axial load < 20 N	0 mm
	> 20 N	0.14 mm
25	Radial play	preloaded
26	Max. axial load (dynamic)	16 N
27	Max. force for press fits (static)	80 N
	(static, shaft supported)	3000 N
28	Max. radial load, 5 mm from flange	75 N

Other specifications

29	Number of pole pairs	2
30	Number of phases	3
31	Weight of motor	860 g

Connection A, motor cable PTFE (AWG 14)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors cable PTFE (AWG 24)

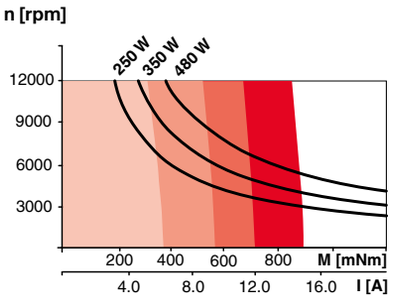
green	V_{Hall} 4.5...24 V
blue	GND
red	Hall sensor 1
black	Hall sensor 2
white	Hall sensor 3

Connection B, motor cable PTFE (AWG 14)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Wiring diagram for Hall sensors see p. 47

Operating Range



TA = 25°C
TA = 100°C
TA = 150°C
TA = 200°C

Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

Application

General
- extreme temperature applications
- vibration tested (according to MIL-STD810F/Jan2000 Fig. 514.5C-10)
- operation in oil and high pressure (only minimal lubrication, therefore use under rated ambient conditions is not suggested)

Oil & Gas Industry
- oil, gas and geothermal wells

Notice

This motor contains leaded solder. It therefore does not fulfill the requirements for the permitted maximum concentration of hazardous substances in accordance with the EC directive 2011/65/EC (RoHS) for all applications. The motor may therefore only be used for devices that are not subject to this directive.

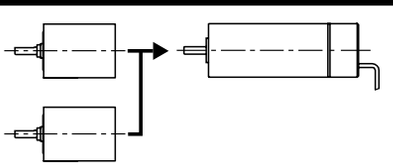
Reference medium: Shell Tellus oil T32
Operation in oil of different viscosity will affect the motor data.

maxon Modular System

Details on catalog page 36

Planetary Gearhead
∅32 mm
3.0 - 8.0 Nm
Page 393

Planetary Gearhead
∅42 mm
10 - 50 Nm
Page 399



For your personal notes

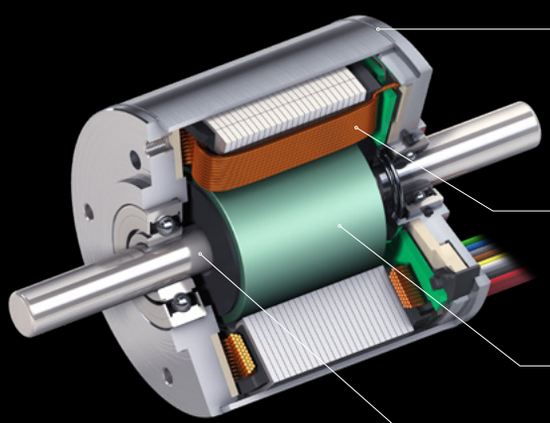
maxon EC-i

maxon EC-i

Powerhouses for extremely small spaces. With their optimized magnetic circuit, these brushless EC-i motors with iron windings offer a very high torque density and very low cogging torque. The multipole internal rotor has excellent dynamics. The robust design with a steel flange and housing makes this unit suitable for a wide variety of applications.

Key data

Motor ∅	30 ... 52 mm
Motor length	26 ... 110 mm
Power	20 ... 200 W
Nominal torque	up to 649 mNm
Max. permissible speed	up to 15 000 rpm



The steel housing and flange ensure good heat dissipation and mechanical stability.

The stator with an iron winding is designed for high power at a low cogging torque.

The modular rotor delivers good dynamics and large torques.

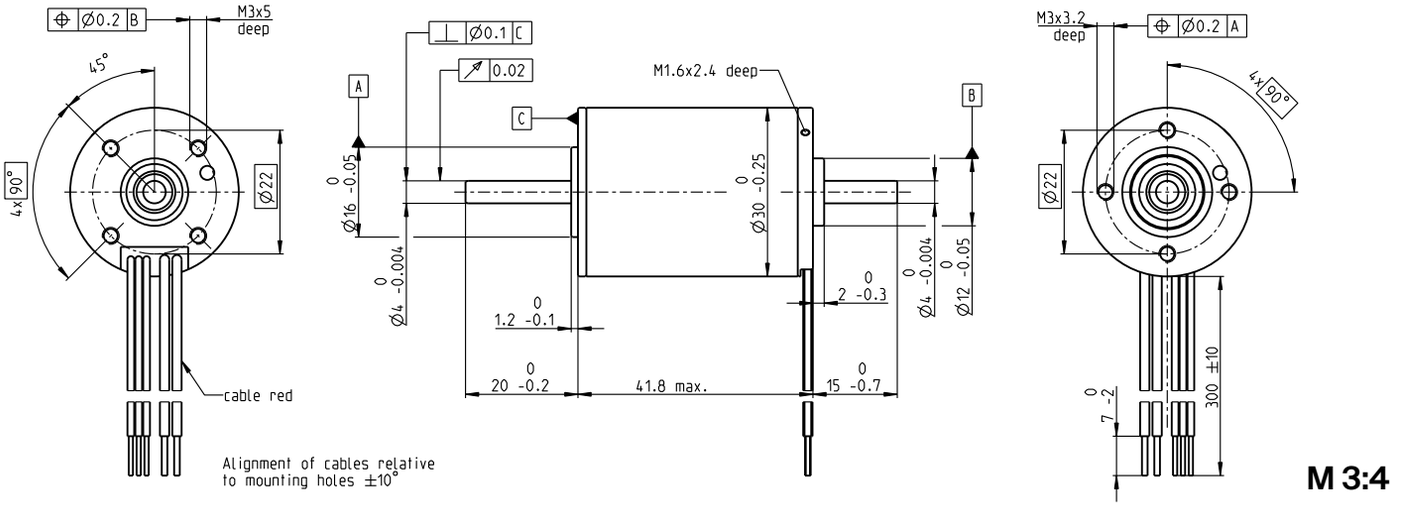
Grooveless shaft ensures smooth running and extremely high torsional rigidity.

- → Highly dynamic due to internal, multi-pole rotor
- → Mechanical time constants of less than 3 milliseconds
- → High torque density
- → Speeds up to 15 000 rpm

shop.maxongroup.com

EC-i 30 ∅30 mm brushless, 20 Watt, with integrated electronics

4-Q-Speed Controller



M 3:4

EC-i

Stock program
Standard program
Special program (on request)

Part Numbers

5 wire version	
Enable	Direction
618864	619301

Motor Data (provisional)									
	Values at nominal voltage								
1	Nominal voltage	V	24	24					
2	No load speed	rpm	6000	6000					
3	No load current	mA	107	107					
4	Nominal speed	rpm	6000	6000					
5	Nominal torque (max. continuous torque)	mNm	32.6	32.6					
6	Nominal current (max. continuous current)	A	1.19	1.19					
33	Max. torque	mNm	105	105					
34	Max. current	A	6.5	6.5					
9	Max. efficiency	%	75.4	75.4					
	Characteristics								
35	Type of control								
36	Supply voltage $+V_{CC}$	V	8...28	8...28					
37	Speed set value input	V	0.42...10.1	0.42...10.1					
38	Scale speed set value input	rpm/V	600	600					
39	Speed range	rpm	250...6060	250...6060					
40	Max. acceleration	rpm/s	6000	6000					

Specifications

Thermal data

17	Thermal resistance housing-ambient	13.0 K/W
18	Thermal resistance winding-housing	5.9 K/W
19	Thermal time constant winding	34.1 s
20	Thermal time constant motor	1030 s
21	Ambient temperature	-40...+85°C
22	Max. winding temperature	+155°C
41	Max. temperature of electronics	100°C

Mechanical data (preloaded ball bearings)

16	Rotor inertia		6.69 gcm²
24	Axial play at axial load	< 9.0 N	0 mm
		> 9.0 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		9 N
27	Max. force for press fits (static)		48.8 N
	(static, shaft supported)		2510 N
28	Max. radial load, 10 mm from flange		30 N

Other specifications

31	Weight of motor	160 g
32	Direction of rotation	Clockwise (CW)

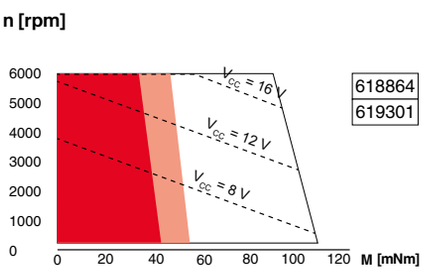
Values listed in the table are nominal.

Protective functions
Overload protection, blockage protection, inverse-polarity protection, thermal overload protection, low/high voltage cut-off

Connection 5 wire version (Cable AWG 20/24)

red	$+V_{CC}$ 8...28 VDC
black	GND
white	Speed set value input
green	Monitor n (6 pulses per revolution)
grey	Disable (Type Enable) or sense of direction (Type Direction)

Operating Range



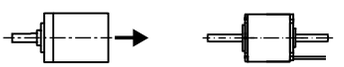
Comments

Continuous operation
Continuous operation with reduced thermal resistance R_{th2} 50%
Intermittent operation

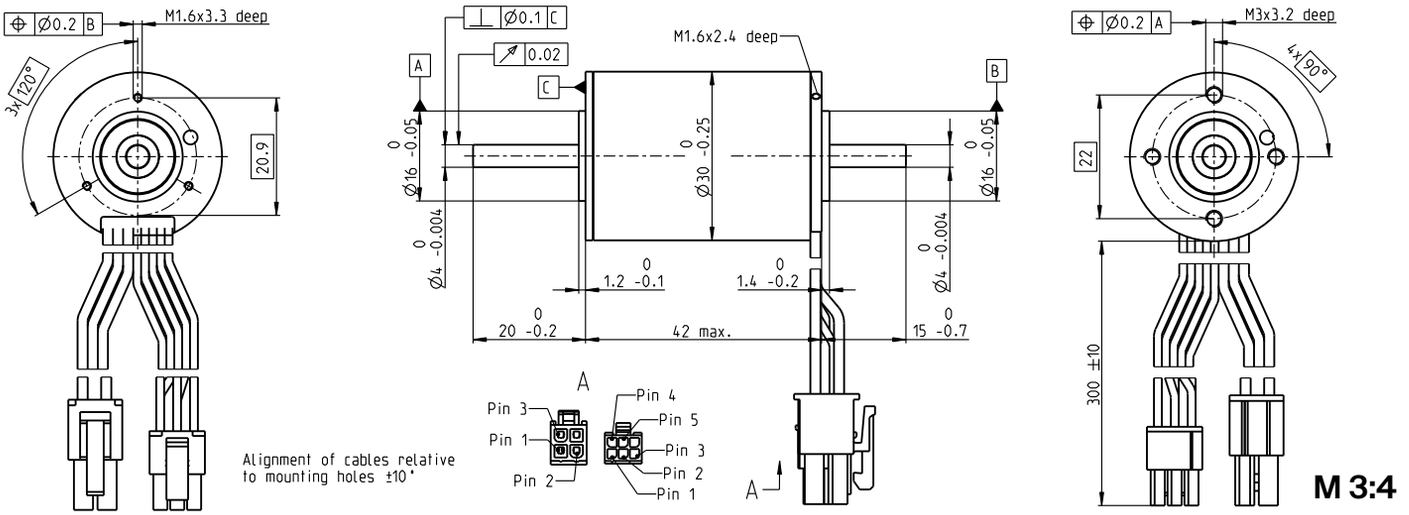
maxon Modular System

Details on catalog page 36

Planetary Gearhead
∅32 mm
1.0 - 6.0 Nm
Page 389



EC-i 30 ∅30 mm, brushless, 30 Watt



Stock program
Standard program
Special program (on request)

Part Numbers

with Hall sensors	539472	539473	539474	539475
Motor Data (provisional)				
Values at nominal voltage				
1 Nominal voltage V	12	24	36	48
2 No load speed rpm	9190	9190	9190	9010
3 No load current mA	206	103	68.6	50.1
4 Nominal speed rpm	7710	7770	7760	7600
5 Nominal torque (max. continuous torque) mNm	37.3	37.3	35.9	37.4
6 Nominal current (max. continuous current) A	3.05	1.52	0.982	0.748
7 Stall torque[1] mNm	341	360	338	358
8 Stall current A	27.7	14.6	9.15	7.11
9 Max. efficiency %	83.7	84.1	83.6	84.1
Characteristics				
10 Terminal resistance phase to phase Ω	0.434	1.64	3.93	6.76
11 Terminal inductance phase to phase mH	0.279	1.12	2.51	4.66
12 Torque constant mNm/A	12.3	24.6	37	50.3
13 Speed constant rpm/V	775	387	258	190
14 Speed/torque gradient rpm/mNm	27.3	25.8	27.5	25.5
15 Mechanical time constant ms	2.08	1.98	2.1	1.95
16 Rotor inertia gcm²	7.3	7.3	7.3	7.3

Specifications

Thermal data

17	Thermal resistance housing-ambient	11.1 K/W
18	Thermal resistance winding-housing	3.75 K/W
19	Thermal time constant winding	29.1 s
20	Thermal time constant motor	849 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+125°C

Mechanical data (preloaded ball bearings)

23	Max. speed		15000 rpm
24	Axial play at axial load	< 9.0 N	0 mm
		> 9.0 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		5 N
27	Max. force for press fits (static)		98 N
	(static, shaft supported)		2000 N
28	Max. radial load, 5 mm from flange		25 N

Other specifications

29	Number of pole pairs	2
30	Number of phases	3
31	Weight of motor	153 g

Values listed in the table are nominal.

Connection motor (Cable AWG 20)

red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

Connector Molex — **Article number** 39-01-2040

Connection sensors (Cable AWG 26)

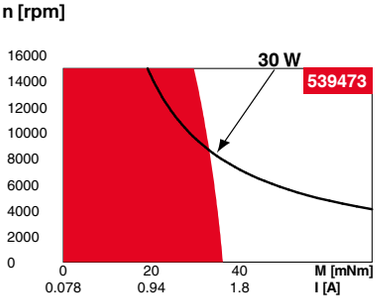
yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V_{Hall} 4.5...24 VDC	Pin 5
	N.C.	Pin 6

Connector Molex — **Article number** 430-25-0600

Wiring diagram for Hall sensors see p. 49

[1]Calculation does not include saturation effect (p. 61/168)

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

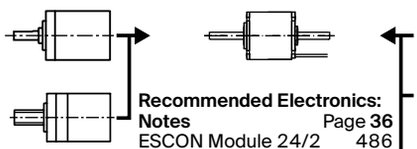
Assigned power rating

maxon Modular System

Details on catalog page 36

Planetary Gearhead
∅32 mm
1.0 - 6.0 Nm
Page 389

Screw Drive
∅32 mm
Page 416–421



Recommended Electronics:

Notes	Page 36
ESCON Module 24/2	486
ESCON 36/3 EC	487
ESCON Mod. 50/4 EC-S	487
ESCON Mod. 50/5	487
ESCON 50/5	489
DEC Module 24/2	491
DEC Module 50/5	491
EPOS4 Mod./Comp. 50/5	496
EPOS4 50/5	501
EPOS2 P 24/5	504

Encoder 16 EASY/XT
128 - 1024 CPT, 3 channels
Page 449/451

Encoder 16 EASY Absolute/XT
4096 steps
Page 453/455

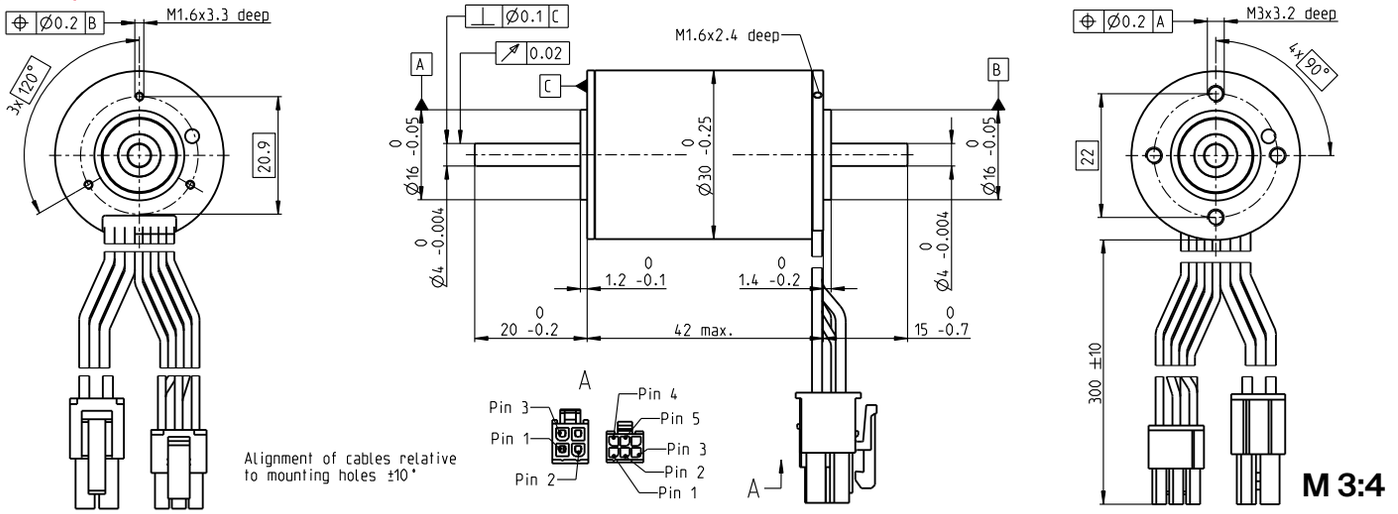
Encoder 16 RIO
1024 - 32768 CPT, 3 channels
Page 466

Encoder HEDL 5540
500 CPT, 3 channels
Page 469

Encoder AEDL 5810
1024 - 5000 CPT, 3 channels
Page 476

EC-i 30 ∅30 mm, brushless, 45 Watt

High Torque



Stock program
Standard program
Special program (on request)

Part Numbers

with Hall sensors	539480	539481	539482	539483	539484
Motor Data (provisional)					
Values at nominal voltage					
1 Nominal voltage V	12	18	24	36	48
2 No load speed rpm	8250	8250	8520	8250	8520
3 No load current mA	273	182	143	91.1	71.5
4 Nominal speed rpm	6710	6760	7030	6790	7050
5 Nominal torque (max. continuous torque) mNm	65.4	67.7	63.8	67.6	63.8
6 Nominal current (max. continuous current) A	4.51	3.09	2.28	1.54	1.14
7 Stall torque[1] mNm	731	840	811	885	835
8 Stall current A	53.2	40.8	30.5	21.5	15.7
9 Max. efficiency %	86.3	87.2	86.9	87.5	87.1
Characteristics					
10 Terminal resistance phase to phase Ω	0.225	0.441	0.787	1.68	3.06
11 Terminal inductance phase to phase mH	0.199	0.449	0.749	1.8	3
12 Torque constant mNm/A	13.7	20.6	26.6	41.2	53.2
13 Speed constant rpm/V	696	464	359	232	180
14 Speed/torque gradient rpm/mNm	11.4	9.94	10.6	9.43	10.3
15 Mechanical time constant ms	0.969	0.843	0.902	0.8	0.876
16 Rotor inertia gcm²	8.1	8.1	8.1	8.1	8.1

Specifications

Thermal data

17	Thermal resistance housing-ambient	11.1 K/W
18	Thermal resistance winding-housing	3.75 K/W
19	Thermal time constant winding	27.8 s
20	Thermal time constant motor	866 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+155°C

Mechanical data (preloaded ball bearings)

23	Max. speed		10 000 rpm
24	Axial play at axial load	< 9.0 N	0 mm
		> 9.0 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		5 N
27	Max. force for press fits (static)		98 N
	(static, shaft supported)		2000 N
28	Max. radial load, 5 mm from flange		25 N

Other specifications

29	Number of pole pairs	4
30	Number of phases	3
31	Weight of motor	156 g

Values listed in the table are nominal.

Connection motor (Cable AWG 20)

red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

Connector	**Article number**
Molex	39-01-2040

Connection sensors (Cable AWG 26)

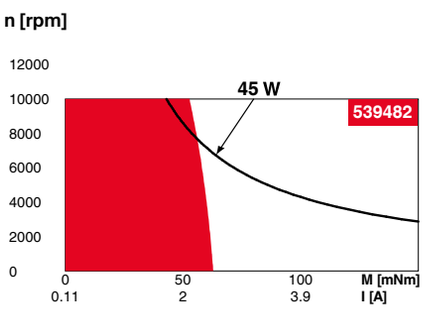
yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V_{Hall} 4.5...24 VDC	Pin 5
	N.C.	Pin 6

Connector	**Article number**
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 49

[1]Calculation does not include saturation effect (p. 61/168)

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

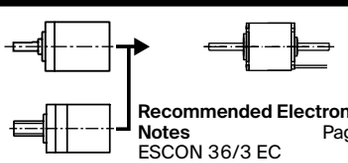
Assigned power rating

maxon Modular System

Details on catalog page 36

Planetary Gearhead
∅32 mm
1.0 - 6.0 Nm
Page 389

Screw Drive
∅32 mm
Page 416–421



Recommended Electronics:

Notes	Page **36**
ESCON 36/3 EC	487
ESCON Mod. 50/4 EC-S	487
ESCON Mod. 50/5	487
ESCON 50/5	489
DEC Module 50/5	491
EPOS4 Mod./Comp. 50/5	496
EPOS4 50/5	501
EPOS2 P 24/5	504

Encoder 16 EASY/XT
128 - 1024 CPT, 3 channels
Page 449/451

Encoder 16 EASY Absolute/XT
4096 steps
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Encoder 16 RIO
1024 - 32768 CPT, 3 channels
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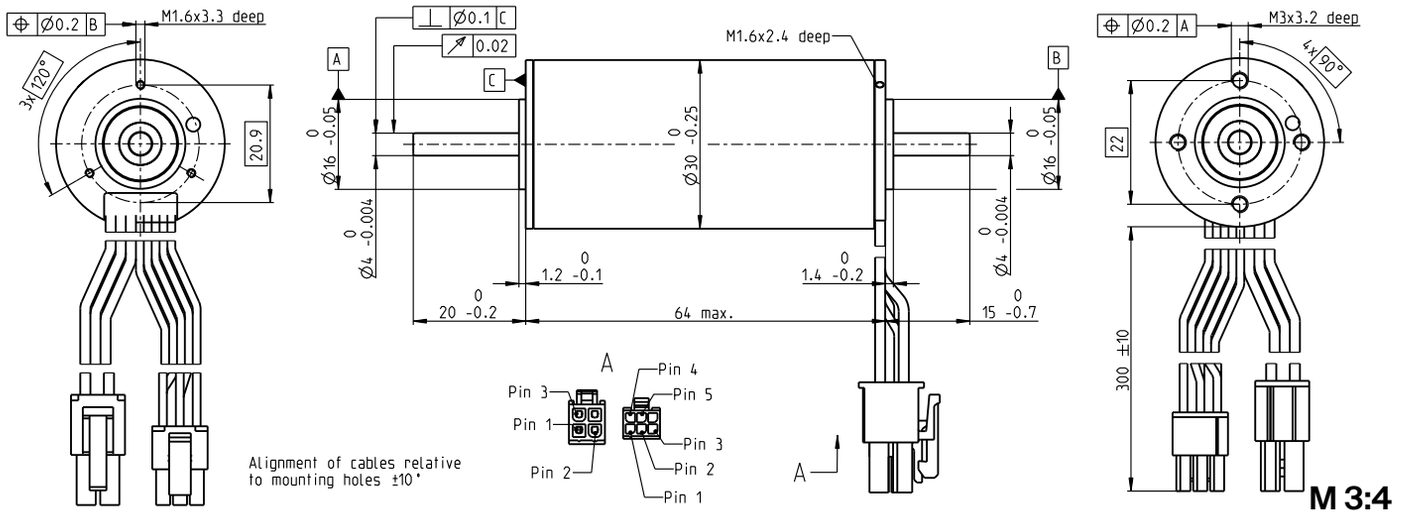
Encoder HEDL 5540
500 CPT, 3 channels
Page 469

Encoder AEDL 5810
1024 - 5000 CPT, 3 channels
Page 476

EC-i 30 ∅30 mm, brushless, 50 Watt



Stock program
Standard program
Special program (on request)

			Part Numbers			
		with Hall sensors	539476	539477	539478	539479
Motor Data (provisional)						
	Values at nominal voltage					
1	Nominal voltage	V	12	24	36	48
2	No load speed	rpm	9950	9960	10300	10200
3	No load current	mA	337	169	117	86.8
4	Nominal speed	rpm	8750	8840	9160	9110
5	Nominal torque (max. continuous torque)	mNm	55.6	55.5	53.1	58.4
6	Nominal current (max. continuous current)	A	4.98	2.48	1.64	1.33
7	Stall torque[1]	mNm	682	768	762	909
8	Stall current	A	59.8	33.7	23	20.4
9	Max. efficiency	%	85.7	86.5	86.3	87.5
	Characteristics					
10	Terminal resistance phase to phase	Ω	0.201	0.713	1.57	2.35
11	Terminal inductance phase to phase	mH	0.119	0.475	1.01	1.82
12	Torque constant	mNm/A	11.4	22.8	33.2	44.6
13	Speed constant	rpm/V	837	418	288	214
14	Speed/torque gradient	rpm/mNm	14.7	13.1	13.6	11.3
15	Mechanical time constant	ms	2.13	1.89	1.96	1.63
16	Rotor inertia	gcm²	13.8	13.8	13.8	13.8

Specifications

Thermal data

17	Thermal resistance housing-ambient		9.01 K/W
18	Thermal resistance winding-housing		2.46 K/W
19	Thermal time constant winding		31.2 s
20	Thermal time constant motor		1080 s
21	Ambient temperature		-40...+100°C
22	Max. winding temperature		+125°C

Mechanical data (preloaded ball bearings)

23	Max. speed		15000 rpm
24	Axial play at axial load	< 9.0 N	0 mm
		> 9.0 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		5 N
27	Max. force for press fits (static)		98 N
	(static, shaft supported)		1300 N
28	Max. radial load, 5 mm from flange		25 N

Other specifications

29	Number of pole pairs	2
30	Number of phases	3
31	Weight of motor	240 g

Values listed in the table are nominal.

Connection motor (Cable AWG 20)

red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

Connector	**Article number**
Molex	39-01-2040

Connection sensors (Cable AWG 26)

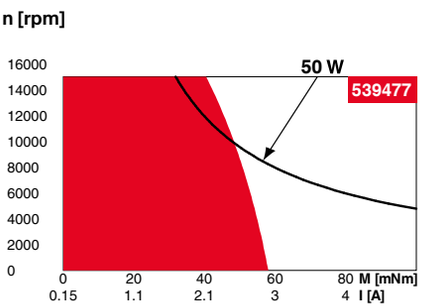
yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V_{Hall} 4.5...24 VDC	Pin 5
	N.C.	Pin 6

Connector	**Article number**
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 49

[1]Calculation does not include saturation effect (p. 61/168)

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

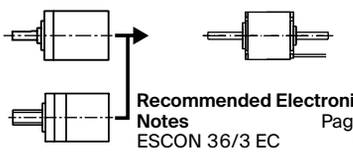
Assigned power rating

maxon Modular System

Details on catalog page 36

Planetary Gearhead
∅32 mm
1.0 - 6.0 Nm
Page 389

Screw Drive
∅32 mm
Page 416–421



Recommended Electronics:

Notes	Page **36**
ESCON 36/3 EC	487
ESCON Mod. 50/4 EC-S	487
ESCON Mod. 50/5	487
ESCON 50/5	489
DEC Module 50/5	491
EPOS4 Mod./Comp. 50/5	496
EPOS4 50/5	501
EPOS2 P 24/5	504

Encoder 16 EASY/XT
128 - 1024 CPT, 3 channels
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Encoder 16 EASY Absolute/XT
4096 steps
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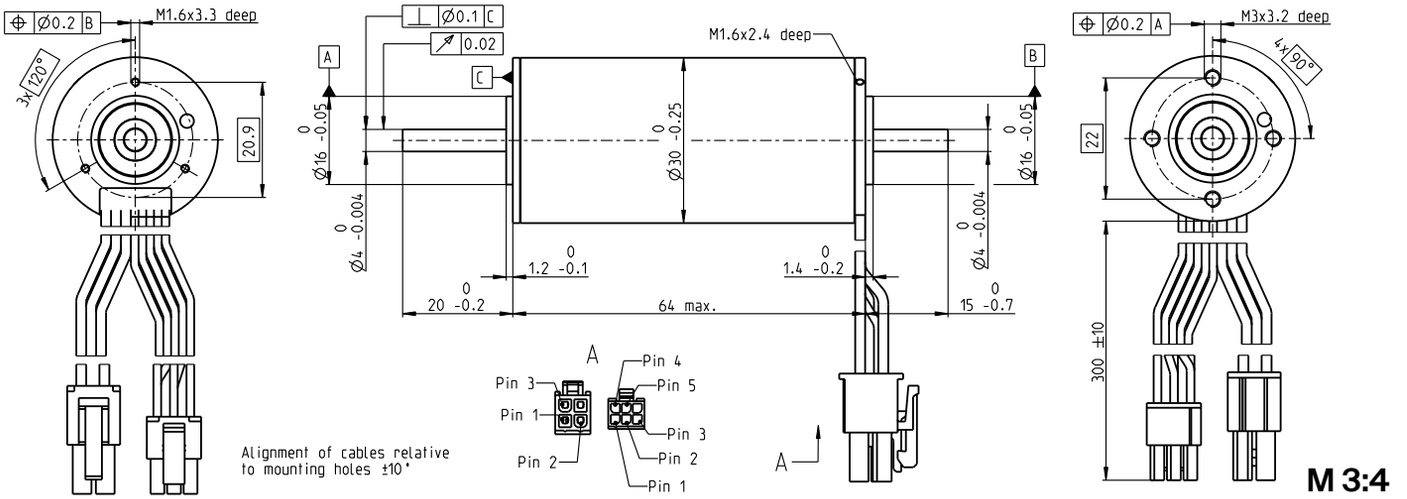
Encoder 16 RIO
1024 - 32768 CPT, 3 channels
Page 467

Encoder HEDL 5540
500 CPT, 3 channels
Page 469

Encoder AEDL 5810
1024 - 5000 CPT, 3 channels
Page 476

EC-i 30 ∅30 mm, brushless, 75 Watt

High Torque



Stock program
Standard program
Special program (on request)

Part Numbers

	with Hall sensors	539485	539486	539487	539488	539489
Motor Data (provisional)						
	Values at nominal voltage					
1	Nominal voltage	V	12	18	24	36	48
2	No load speed	rpm	7940	7950	7950	7950	8210
3	No load current	mA	447	298	223	149	117
4	Nominal speed	rpm	6760	6840	6870	6890	7150
5	Nominal torque (max. continuous torque)	mNm	108	110	107	110	104
6	Nominal current (max. continuous current)	A	7.32	4.97	3.64	2.48	1.83
7	Stall torque[1]	mNm	1460	1770	1800	1970	1910
8	Stall current	A	102	82.5	63.1	46	34.6
9	Max. efficiency	%	87.3	88.5	88.6	89	88.8
	Characteristics						
10	Terminal resistance phase to phase	Ω	0.118	0.218	0.38	0.782	1.39
11	Terminal inductance phase to phase	mH	0.0975	0.219	0.39	0.877	1.46
12	Torque constant	mNm/A	14.3	21.4	28.6	42.9	55.4
13	Speed constant	rpm/V	668	446	334	223	173
14	Speed/torque gradient	rpm/mNm	5.5	4.54	4.45	4.07	4.33
15	Mechanical time constant	ms	0.893	0.736	0.722	0.66	0.702
16	Rotor inertia	gcm²	15.5	15.5	15.5	15.5	15.5

Specifications

Thermal data

17	Thermal resistance housing-ambient	9.01 K/W
18	Thermal resistance winding-housing	2.46 K/W
19	Thermal time constant winding	32.7 s
20	Thermal time constant motor	1090 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+155°C

Mechanical data (preloaded ball bearings)

23	Max. speed		10 000 rpm
24	Axial play at axial load	< 9.0 N	0 mm
		> 9.0 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		5 N
27	Max. force for press fits (static)		98 N
	(static, shaft supported)		1300 N
28	Max. radial load, 5 mm from flange		25 N

Other specifications

29	Number of pole pairs	4
30	Number of phases	3
31	Weight of motor	242 g

Values listed in the table are nominal.

Connection motor (Cable AWG 20)

red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

Connector	**Article number**
Molex	39-01-2040

Connection sensors (Cable AWG 26)

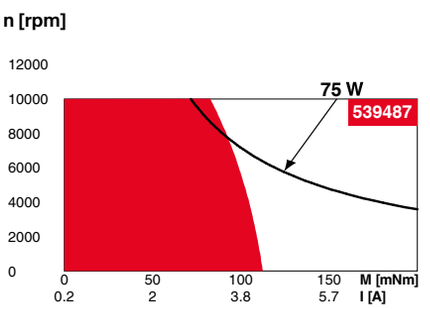
yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V_{Hall} 4.5...24 VDC	Pin 5
	N.C.	Pin 6

Connector	**Article number**
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 49

[1]Calculation does not include saturation effect (p. 61/168)

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 36

Planetary Gearhead
∅32 mm
1.0 - 6.0 Nm
Page 389

Screw Drive
∅32 mm
Page 416–421

Recommended Electronics:

Notes	Page **36**
ESCON 36/3 EC	487
ESCON Mod. 50/4 EC-S	487
ESCON Mod. 50/5	487
ESCON Mod. 50/8 (HE)	488
ESCON 50/5	489
DEC Module 50/5	491
EPOS4 Mod./Comp. 50/5	496
EPOS4 Mod./Comp. 50/8	497
EPOS4 50/5	501
EPOS4 70/15	501
EPOS2 P 24/5	504

Encoder 16 EASY/XT
128 - 1024 CPT, 3 channels
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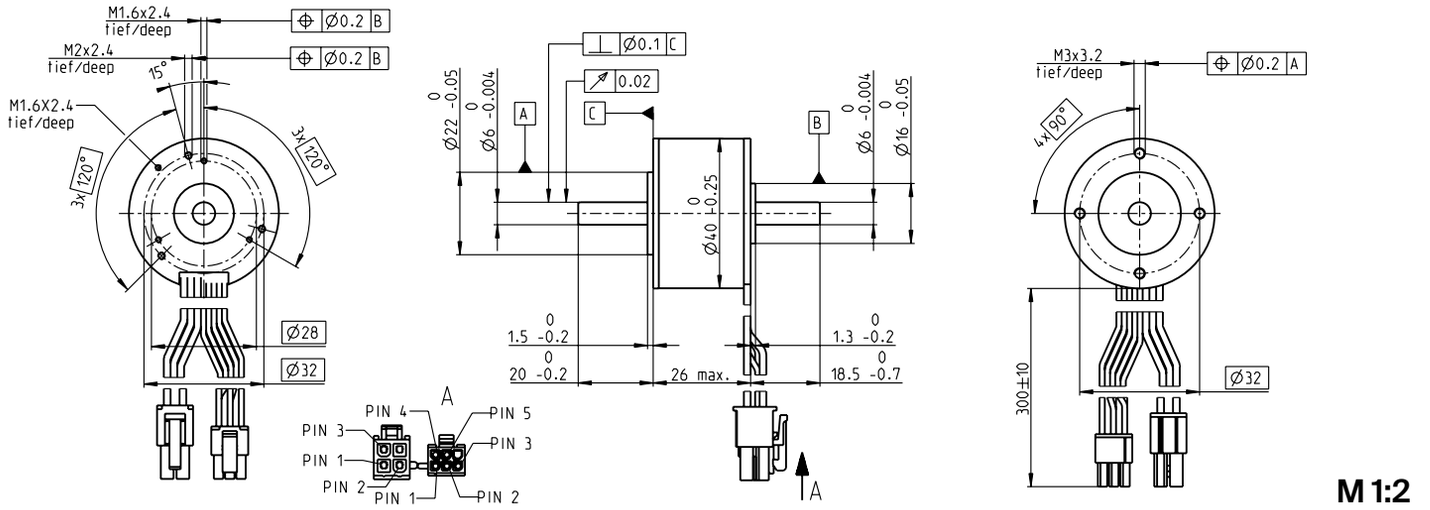
Encoder 16 EASY Absolute/XT
4096 steps
Page 454/456

Encoder 16 RIO
1024 - 32768 CPT, 3 channels
Page 467

Encoder HEDL 5540
500 CPT, 3 channels
Page 469

Encoder AEDL 5810
1024 - 5000 CPT, 3 channels
Page 476

EC-i 40 ∅40 mm, brushless, 50 Watt



M 1:2

Stock program
Standard program
Special program (on request)

			Part Numbers	
		with Hall sensors	449463	449464
Motor Data				
	Values at nominal voltage			
1	Nominal voltage	V	12	24
2	No load speed	rpm	12400	13200
3	No load current	mA	522	285
4	Nominal speed	rpm	9660	10300
5	Nominal torque (max. continuous torque)	mNm	43.3	52.8
6	Nominal current (max. continuous current)	A	4.53	2.8
7	Stall torque[1]	mNm	473	810
8	Stall current	A	52.9	47.9
9	Max. efficiency	%	81	85
	Characteristics			
10	Terminal resistance phase to phase	Ω	0.227	0.501
11	Terminal inductance phase to phase	mH	0.109	0.39
12	Torque constant	mNm/A	8.95	16.9
13	Speed constant	rpm/V	1070	565
14	Speed/torque gradient	rpm/mNm	27.1	16.7
15	Mechanical time constant	ms	2.98	1.84
16	Rotor inertia	gcm²	10.5	10.5

Specifications

Thermal data

17	Thermal resistance housing-ambient	9.66 K/W
18	Thermal resistance winding-housing	2.57 K/W
19	Thermal time constant winding	17.5 s
20	Thermal time constant motor	821 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+155°C

Mechanical data (preloaded ball bearings)

23	Max. speed		15000 rpm
24	Axial play at axial load	< 9.0 N	0 mm
		> 9.0 N	0.15 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		5 N
27	Max. force for press fits (static)		87 N
	(static, shaft supported)		6500 N
28	Max. radial load, 5 mm from flange		15 N

Other specifications

29	Number of pole pairs	7
30	Number of phases	3
31	Weight of motor	170 g

Values listed in the table are nominal.

Connection motor (Cable AWG 20)

red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

Connector	**Article number**
Molex	39-01-2040

Connection sensor (Cable AWG 26)

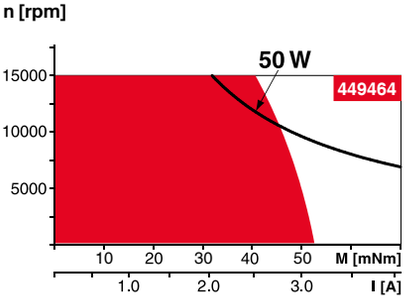
yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V_{Hall} 4.5...24 VDC	Pin 5
	N.C.	Pin 6

Connector	**Article number**
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 49

[1]Calculation does not include saturation effect (p. 61/168)

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

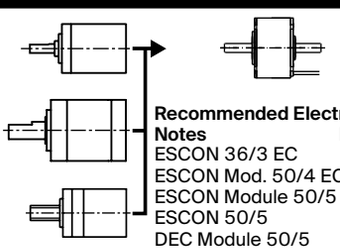
maxon Modular System

Details on catalog page 36

Planetary Gearhead
∅32 mm
1.0 - 6.0 Nm
Page 389

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 398

Screw Drive
∅32 mm
Page 416–421



Recommended Electronics:

Notes	Page **36**
ESCON 36/3 EC	487
ESCON Mod. 50/4 EC-S	487
ESCON Module 50/5	487
ESCON 50/5	489
DEC Module 50/5	491
EPOS4 Mod./Comp. 50/5	496
EPOS4 50/5	501
EPOS2 P 24/5	504

Encoder 16 EASY/XT
128 - 1024 CPT, 3 channels
Page 450/452

Encoder 16 EASY Absolute/XT
4096 steps
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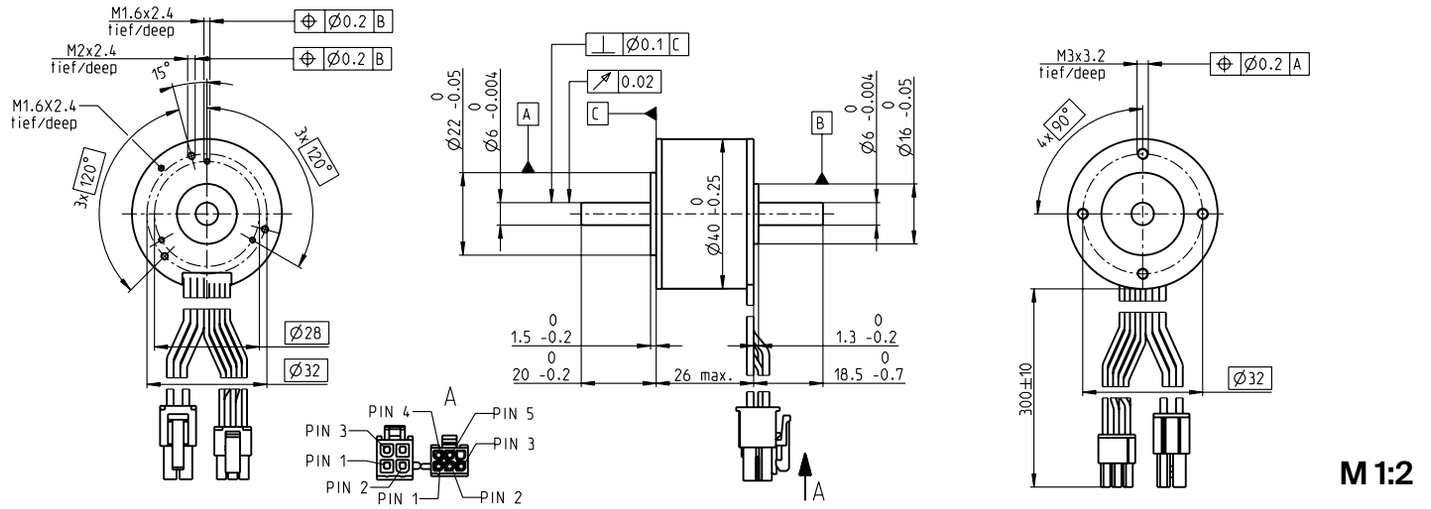
Encoder 16 RIO
1024 - 32768 CPT, 3 channels
Page 467

Encoder AEDL 5810
1024 - 5000 CPT, 3 channels
Page 470

Encoder HEDL 5540
500 CPT, 3 channels
Page 477

EC-i 40 ∅40 mm, brushless, 50 Watt

High Torque



Stock program
Standard program
Special program (on request)

Part Numbers

with Hall sensors	496650	496651	496652	496653
Motor Data				
Values at nominal voltage				
1 Nominal voltage V	9	18	36	48
2 No load speed rpm	7770	7790	7350	7560
3 No load current mA	577	289	131	103
4 Nominal speed rpm	6390	6520	6080	6310
5 Nominal torque (max. continuous torque) mNm	65.2	64.6	78.2	73.3
6 Nominal current (max. continuous current) A	5.91	2.93	1.61	1.18
7 Stall torque[1] mNm	716	858	1150	1090
8 Stall current A	66	39.5	25	18.2
9 Max. efficiency %	82	84	86	85
Characteristics				
10 Terminal resistance phase to phase Ω	0.136	0.455	1.44	2.63
11 Terminal inductance phase to phase mH	0.064	0.255	1.15	1.93
12 Torque constant mNm/A	10.8	21.7	46.1	59.6
13 Speed constant rpm/V	881	440	207	160
14 Speed/torque gradient rpm/mNm	11.1	9.24	6.48	7.07
15 Mechanical time constant ms	1.48	1.24	0.869	0.948
16 Rotor inertia gcm²	12.8	12.8	12.8	12.8

Specifications

Thermal data

17	Thermal resistance housing-ambient	9.91 K/W
18	Thermal resistance winding-housing	3.77 K/W
19	Thermal time constant winding	25.6 s
20	Thermal time constant motor	892 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+155°C

Mechanical data (preloaded ball bearings)

23	Max. speed		10 000 rpm
24	Axial play at axial load	< 9.0 N	0 mm
		> 9.0 N	0.15 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		7 N
27	Max. force for press fits (static)		87 N
	(static, shaft supported)		6500 N
28	Max. radial load, 5 mm from flange		21 N

Other specifications

29	Number of pole pairs	7
30	Number of phases	3
31	Weight of motor	180 g

Values listed in the table are nominal.

Connection motor (Cable AWG 20)

red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

Connector	**Article number**
Molex	39-01-2040

Connection sensor (Cable AWG 26)

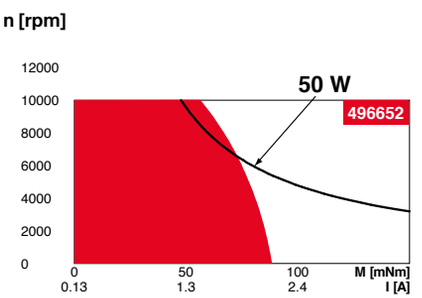
yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V_{Hall} 4.5...24 VDC	Pin 5
	N.C.	Pin 6

Connector	**Article number**
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 49

[1]Calculation does not include saturation effect (p. 61/168)

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

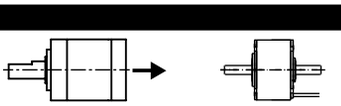
Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 36

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 398



Recommended Electronics:

Notes	**Page 36**
ESCON 36/3 EC	487
ESCON Mod. 50/4 EC-S	487
ESCON Module 50/5	487
ESCON Mod. 50/8 (HE)	488
ESCON 50/5	489
ESCON 70/10	489
DEC Module 50/5	491
EPOS4 Mod./Comp. 50/5	496
EPOS4 Mod./Comp. 50/8	499
EPOS4 50/5	501
EPOS4 70/15	501
EPOS2 P 24/5	504

Encoder 16 EASY/XT
128 - 1024 CPT, 3 channels
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Encoder 16 EASY Absolute/XT
4096 steps
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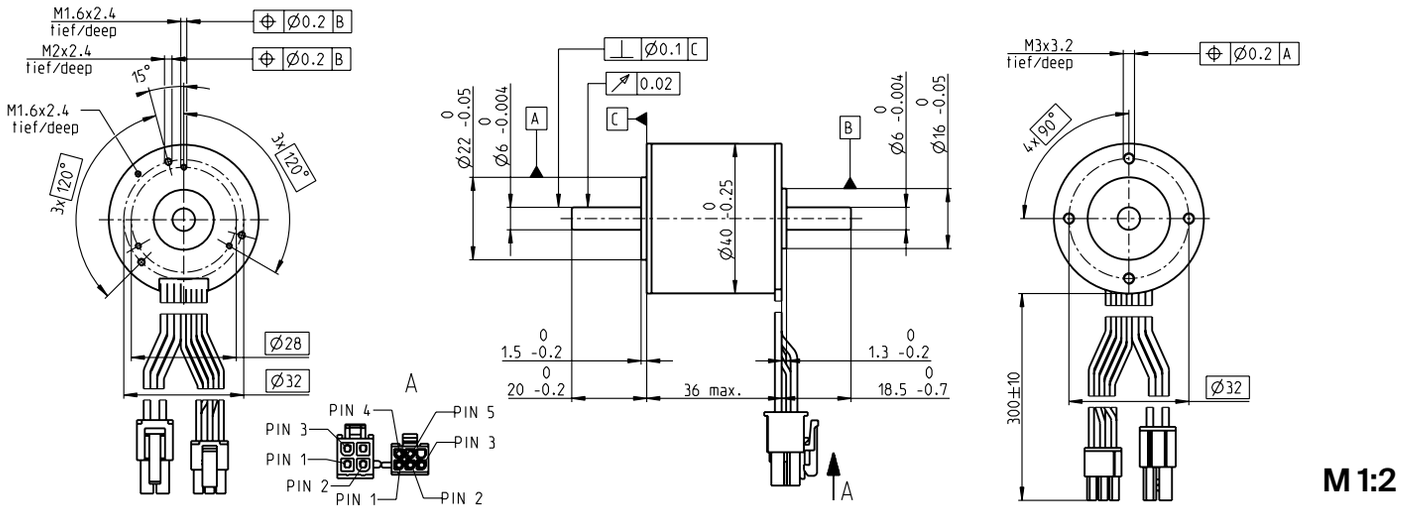
Encoder 16 RIO
1024 - 32768 CPT, 3 channels
Page 467
Encoder AEDL 5810
1024 - 5000 CPT, 3 channels
Page 470
Encoder HEDL 5540
500 CPT, 3 channels
Page 477

EC-i 40 ∅40 mm, brushless, 70 Watt



M 1:2

Stock program
Standard program
Special program (on request)

	Part Numbers							
with Hall sensors	449469	449470						

Motor Data									
Values at nominal voltage									
1 Nominal voltage	V	18	36						
2 No load speed	rpm	10100	10700						
3 No load current	mA	354	192						
4 Nominal speed	rpm	8230	8740						
5 Nominal torque (max. continuous torque)	mNm	68.7	83.4						
6 Nominal current (max. continuous current)	A	3.93	2.43						
7 Stall torque[1]	mNm	876	1460						
8 Stall current	A	52.5	46.3						
9 Max. efficiency	%	84	87						
Characteristics									
10 Terminal resistance phase to phase	Ω	0.343	0.778						
11 Terminal inductance phase to phase	mH	0.18	0.644						
12 Torque constant	mNm/A	16.7	31.5						
13 Speed constant	rpm/V	572	303						
14 Speed/torque gradient	rpm/mNm	11.7	7.47						
15 Mechanical time constant	ms	2.98	1.89						
16 Rotor inertia	gcm²	24.2	24.2						

Specifications

Thermal data

17	Thermal resistance housing-ambient	7.8 K/W
18	Thermal resistance winding-housing	2.6 K/W
19	Thermal time constant winding	28.1 s
20	Thermal time constant motor	936 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+155°C

Mechanical data (preloaded ball bearings)

23	Max. speed		15000 rpm
24	Axial play at axial load	< 9.0 N	0 mm
		> 9.0 N	0.15 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		5 N
27	Max. force for press fits (static)		87 N
	(static, shaft supported)		5000 N
28	Max. radial load, 5 mm from flange		15 N

Other specifications

29	Number of pole pairs	7
30	Number of phases	3
31	Weight of motor	240 g

Values listed in the table are nominal.

Connection motor (Cable AWG 20)

red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

Connector	Article number
Molex	39-01-2040

Connection sensor (Cable AWG 26)

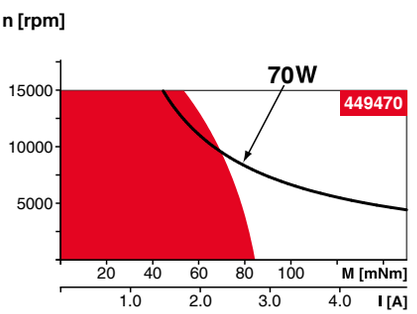
yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V_{Hall} 4.5...24 VDC	Pin 5
	N.C.	Pin 6

Connector	Article number
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 49

[1]Calculation does not include saturation effect (p. 61/168)

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

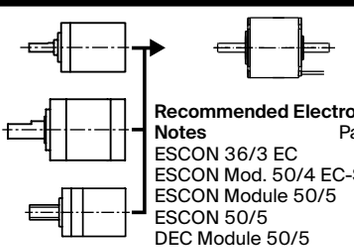
maxon Modular System

Details on catalog page 36

Planetary Gearhead
∅32 mm
1.0 - 6.0 Nm
Page 389

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 398

Screw Drive
∅32 mm
Page 416–421



Recommended Electronics:

Notes	Page 36
ESCON 36/3 EC	487
ESCON Mod. 50/4 EC-S	487
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ESCON 50/5	489
DEC Module 50/5	491
EPOS4 Mod./Comp. 50/5	496
EPOS4 50/5	501
EPOS2 P 24/5	504

Encoder 16 EASY/XT
128 - 1024 CPT, 3 channels
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Encoder 16 EASY Absolute/XT
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Encoder 16 RIO
1024 - 32768 CPT, 3 channels
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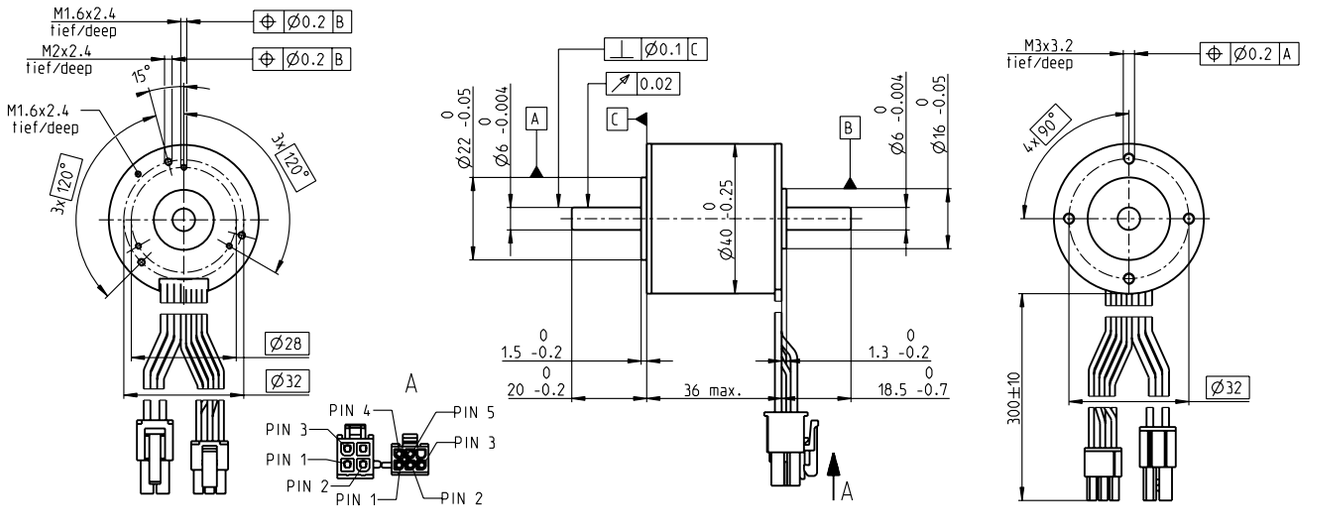
Encoder AEDL 5810
1024 - 5000 CPT, 3 channels
Page 470

Encoder HEDL 5540
500 CPT, 3 channels
Page 477

EC-i 40 ∅40 mm, brushless, 70 Watt

High Torque



M 1:2

EC-i

Stock program
Standard program
Special program (on request)

Part Numbers

with Hall sensors	496654	496655	496656
Motor Data			
Values at nominal voltage			
1 Nominal voltage V	18	36	48
2 No load speed rpm	7840	7390	4930
3 No load current mA	448	205	86.4
4 Nominal speed rpm	6890	6450	4100
5 Nominal torque (max. continuous torque) mNm	105	129	151
6 Nominal current (max. continuous current) A	4.87	2.73	1.55
7 Stall torque[1] mNm	1960	2800	1940
8 Stall current A	90.4	60.9	21.1
9 Max. efficiency %	86	89	87
Characteristics			
10 Terminal resistance phase to phase Ω	0.199	0.591	2.28
11 Terminal inductance phase to phase mH	0.113	0.512	2.05
12 Torque constant mNm/A	21.7	46.1	92.1
13 Speed constant rpm/V	441	207	104
14 Speed/torque gradient rpm/mNm	4.05	2.66	2.56
15 Mechanical time constant ms	0.975	0.641	0.617
16 Rotor inertia gcm²	23	23	23

Specifications

Thermal data

17	Thermal resistance housing-ambient	8.17 K/W
18	Thermal resistance winding-housing	2.27 K/W
19	Thermal time constant winding	24.5 s
20	Thermal time constant motor	1020 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+155°C

Mechanical data (preloaded ball bearings)

23	Max. speed		10 000 rpm
24	Axial play at axial load	< 9.0 N	0 mm
		> 9.0 N	0.15 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		7 N
27	Max. force for press fits (static)		87 N
	(static, shaft supported)		5000 N
28	Max. radial load, 5 mm from flange		26 N

Other specifications

29	Number of pole pairs	7
30	Number of phases	3
31	Weight of motor	250 g

Values listed in the table are nominal.

Connection motor (Cable AWG 20)

red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

Connector	**Article number**
Molex	39-01-2040

Connection sensor (Cable AWG 26)

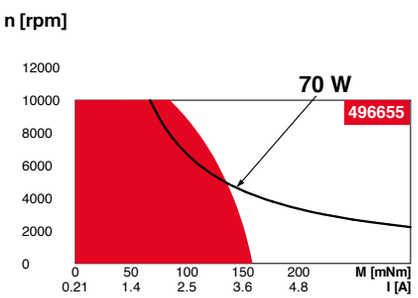
yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V_{Hall} 4.5...24 VDC	Pin 5
	N.C.	Pin 6

Connector	**Article number**
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 49

[1]Calculation does not include saturation effect (p. 61/168)

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

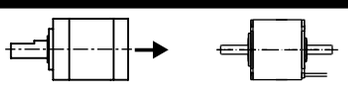
Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 36

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 398



Recommended Electronics:

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ESCON 36/3 EC	487
ESCON Mod. 50/4 EC-S	487
ESCON Module 50/5	487
ESCON 50/5	489
DEC Module 50/5	491
EPOS4 Mod./Comp. 50/5	496
EPOS4 50/5	501
EPOS2 P 24/5	504

Encoder 16 EASY/XT
128 - 1024 CPT, 3 channels
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Encoder 16 EASY Absolute/XT
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Encoder AEDL 5810
1024 - 5000 CPT, 3 channels
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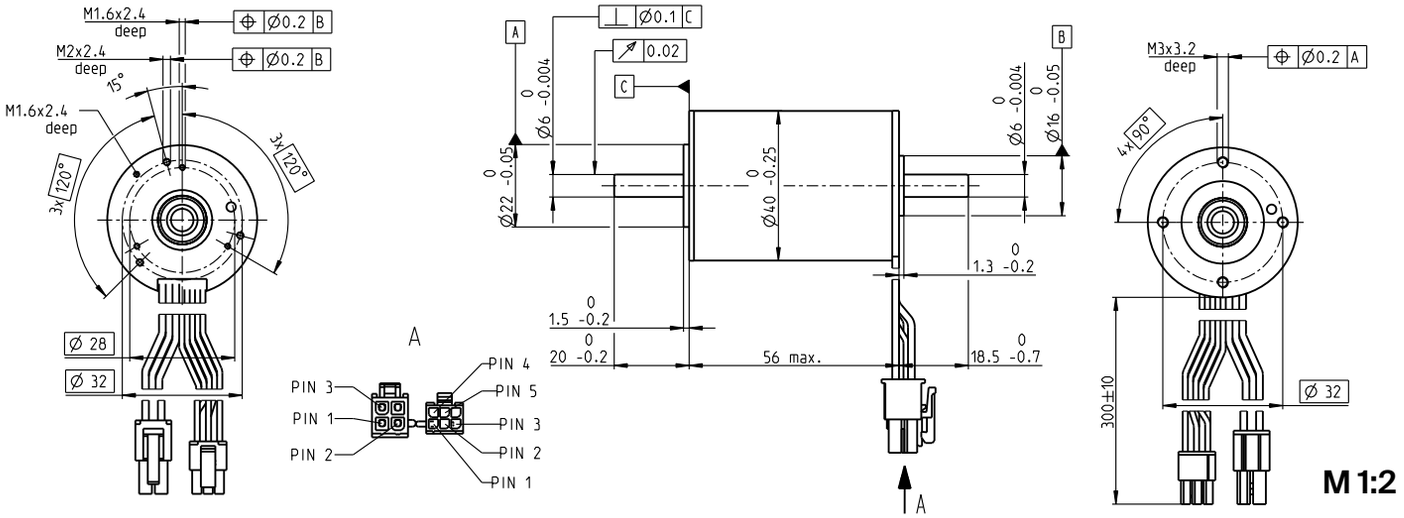
Encoder HEDL 5540
500 CPT, 3 channels
Page 477

EC-i 40 ∅40 mm, brushless, 100 Watt

High Torque



Stock program
Standard program
Special program (on request)

		Part Numbers								
	with Hall sensors	496660	496661	488607						
Motor Data										
	Values at nominal voltage									
1	Nominal voltage	V	18	36	48					
2	No load speed	rpm	4540	4550	5000					
3	No load current	mA	352	176	150					
4	Nominal speed	rpm	3920	3950	4390					
5	Nominal torque (max. continuous torque)	mNm	207	207	222					
6	Nominal current (max. continuous current)	A	5.46	2.72	2.39					
7	Stall torque[1]	mNm	2860	3160	4330					
8	Stall current	A	76.3	42.2	47.5					
9	Max. efficiency	%	87	87	89					
	Characteristics									
10	Terminal resistance phase to phase	Ω	0.236	0.853	1.01					
11	Terminal inductance phase to phase	mH	0.169	0.675	0.995					
12	Torque constant	mNm/A	37.5	74.9	91					
13	Speed constant	rpm/V	255	127	105					
14	Speed/torque gradient	rpm/mNm	1.6	1.45	1.16					
15	Mechanical time constant	ms	0.739	0.669	0.537					
16	Rotor inertia	gcm²	44	44	44					

Specifications

Thermal data

17	Thermal resistance housing-ambient		7.17 K/W
18	Thermal resistance winding-housing		1.35 K/W
19	Thermal time constant winding		20.7 s
20	Thermal time constant motor		1400 s
21	Ambient temperature		-40...+100°C
22	Max. winding temperature		+155°C

Mechanical data (preloaded ball bearings)

23	Max. speed		8000 rpm
24	Axial play at axial load	< 9.0 N	0 mm
		> 9.0 N	0.15 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		7 N
27	Max. force for press fits (static)		87 N
	(static, shaft supported)		3000 N
28	Max. radial load, 5 mm from flange		29.9 N

Other specifications

29	Number of pole pairs	7
30	Number of phases	3
31	Weight of motor	390 g

Values listed in the table are nominal.

Connection motor (Cable AWG 20)

red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

Connector	**Article number**
Molex	39-01-2040

Connection sensor (Cable AWG 26)

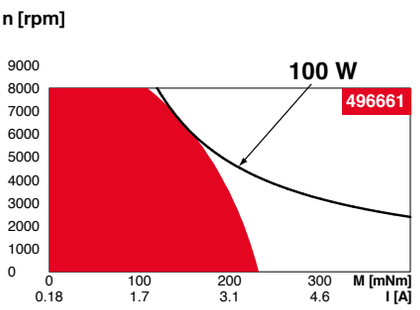
yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V_{Hall} 4.5...24 VDC	Pin 5
	N.C.	Pin 6

Connector	**Article number**
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 49

[1]Calculation does not include saturation effect (p. 61/168)

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 36

Planetary Gearhead
∅42 mm
3 - 15 Nm
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Recommended Electronics:

Notes	Page **36**
ESCON 36/3 EC	487
ESCON Mod. 50/4 EC-S	487
ESCON Module 50/5	487
ESCON Mod. 50/8 (HE)	488
ESCON 50/5	489
ESCON 70/10	489
DEC Module 50/5	491
EPOS4 Mod./Comp. 50/5	496
EPOS4 Mod./Comp. 50/8	499
EPOS4 50/5	501
EPOS4 70/15	501
EPOS2 P 24/5	504

Encoder 16 EASY/XT
128 - 1024 CPT, 3 channels
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Encoder AEDL 5810
1024 - 5000 CPT, 3 channels
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Encoder HEDL 5540
500 CPT, 3 channels
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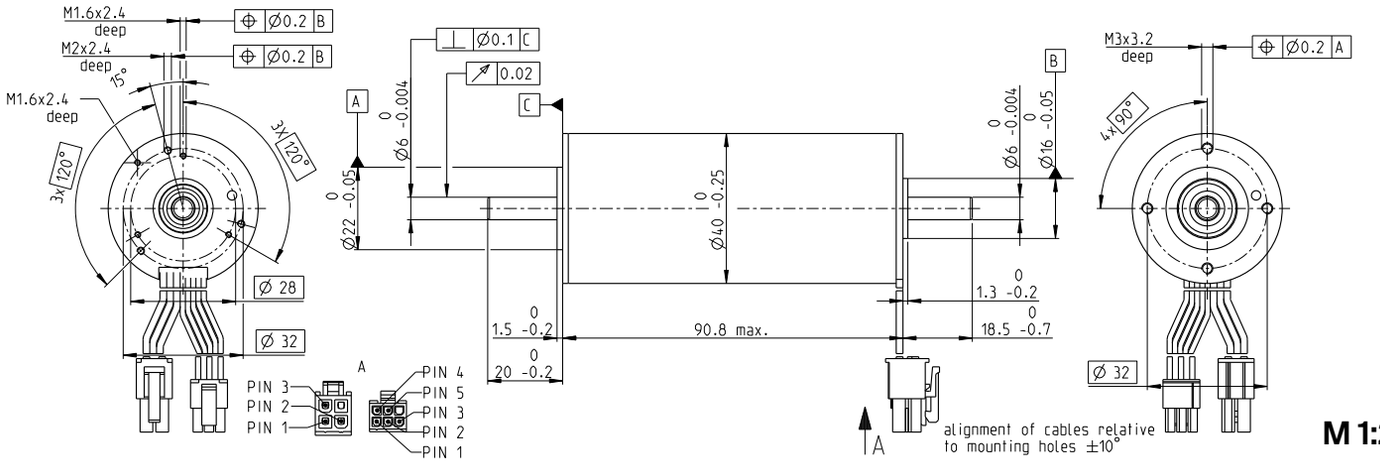
EC-i 40 ∅40 mm, brushless, 130 Watt

NEW

High Torque



Stock program
Standard program
Special program (on request)

Part Numbers

with Hall sensors	666601	676600	666602	666603

Motor Data						
	Values at nominal voltage					
1	Nominal voltage	V	18	24	36	48
2	No load speed	rpm	4670	4730	4670	4640
3	No load current	mA	496	379	248	185
4	Nominal speed	rpm	3920	3990	3940	3910
5	Nominal torque (max. continuous torque)	mNm	276	299	327	340
6	Nominal current (max. continuous current)	A	7.38	6.01	4.27	3.29
7	Stall torque[1]	mNm	3320	4090	4950	5360
8	Stall current	A	91	85	68	55
9	Max. efficiency	%	85.9	87.2	88.4	88.8
	Characteristics					
10	Terminal resistance phase to phase	Ω	0.198	0.281	0.529	0.876
11	Terminal inductance phase to phase	mH	0.128	0.222	0.512	0.922
12	Torque constant	mNm/A	36.4	47.9	72.8	97.8
13	Speed constant	rpm/V	262	199	131	97.7
14	Speed/torque gradient	rpm/mNm	1.420	1.170	0.953	0.875
15	Mechanical time constant	ms	1.16	0.956	0.778	0.715
16	Rotor inertia	gcm²	78	78	78	78

Specifications

	Thermal data		
17	Thermal resistance housing-ambient		5.08 K/W
18	Thermal resistance winding-housing		0.6 K/W
19	Thermal time constant winding		18.5 s
20	Thermal time constant motor		1490 s
21	Ambient temperature		-40...+100°C
22	Max. winding temperature		+155°C
	Mechanical data (preloaded ball bearings)		
23	Max. speed		8000 rpm
24	Axial play at axial load	< 9.0 N	0 mm
		> 9.0 N	0.15 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		7 N
27	Max. force for press fits (static)		87 N
	(static, shaft supported)		3000 N
28	Max. radial load, 5 mm from flange		29.9 N
	Other specifications		
29	Number of pole pairs		8
30	Number of phases		3
31	Weight of motor		587 g

Values listed in the table are nominal.

Connection motor (Cable AWG 20)

red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

Connector	**Article number**
Molex	39-01-2040

Connection sensor (Cable AWG 26)

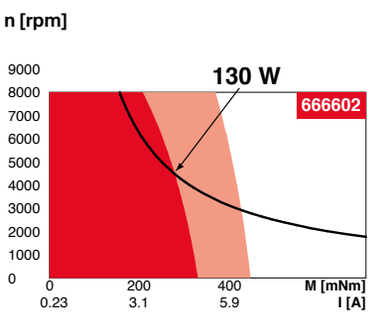
yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V_{Hall} 4.5...24 VDC	Pin 5
	N.C.	Pin 6

Connector	**Article number**
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 49

[1]Calculation does not include saturation effect (p. 61/168)

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 36

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 398

Recommended Electronics:

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ESCON Mod. 50/4 EC-S	487
ESCON Module 50/5	487
ESCON Mod. 50/8 (HE)	488
ESCON 50/5	489
ESCON 70/10	489
DEC Module 50/5	491
EPOS4 Mod./Comp. 50/5	499
EPOS4 Mod./Comp. 50/8	499
EPOS4 50/5	501
EPOS4 70/15	501
EPOS2 P 24/5	504

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Encoder HEDL 5540
500 CPT, 3 channels
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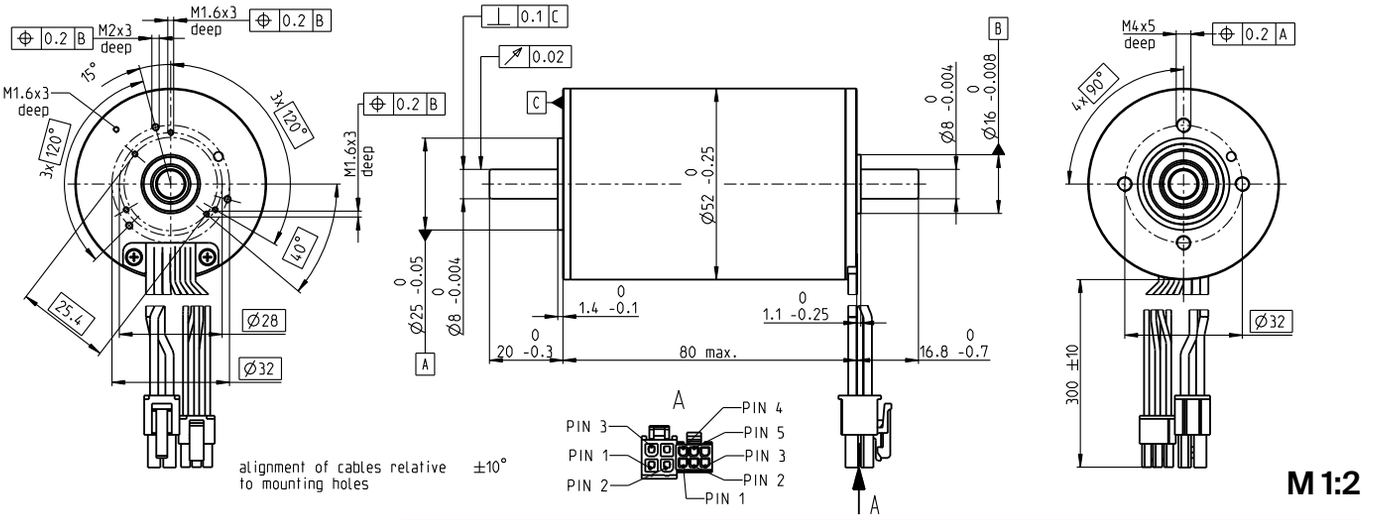
EC-i 52 ∅52 mm, brushless, 180 Watt

High Torque



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

with Hall sensors	574740	574741	579164	579165
Motor Data (provisional)				
Values at nominal voltage				
1 Nominal voltage V	18	24	36	48
2 No load speed rpm	4820	4680	4820	4900
3 No load current mA	1010	726	507	390
4 Nominal speed rpm	4360	4200	4360	4450
5 Nominal torque (max. continuous torque) mNm	388	428	438	412
6 Nominal current (max. continuous current) A	11.1	8.81	6.18	4.47
7 Stall torque[1] mNm	11500	13000	15900	15700
8 Stall current A	325	268	225	169
9 Max. efficiency %	89.3	90	90.8	90.7
Characteristics				
10 Terminal resistance phase to phase Ω	0.0555	0.0894	0.16	0.284
11 Terminal inductance phase to phase mH	0.0643	0.122	0.257	0.443
12 Torque constant mNm/A	35.3	48.6	70.6	92.7
13 Speed constant rpm/V	270	197	135	103
14 Speed/torque gradient rpm/mNm	0.425	0.362	0.306	0.316
15 Mechanical time constant ms	0.756	0.645	0.544	0.562
16 Rotor inertia gcm²	170	170	170	170

Specifications

Thermal data

17	Thermal resistance housing-ambient	4.32 K/W
18	Thermal resistance winding-housing	0.63 K/W
19	Thermal time constant winding	10.2 s
20	Thermal time constant motor	1780 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+155°C

Mechanical data (preloaded ball bearings)

23	Max. speed		6000 rpm
24	Axial play at axial load	< 15 N	0 mm
		> 15 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		12 N
27	Max. force for press fits (static)		150 N
	(static, shaft supported)		6000 N
28	Max. radial load, 5 mm from flange		110 N

Other specifications

29	Number of pole pairs	8
30	Number of phases	3
31	Weight of motor	823 g

Values listed in the table are nominal.

Connection motor (Cable AWG 16)

red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

Connector	**Article number**
Molex	39-01-2040

Connection sensor (Cable AWG 26)

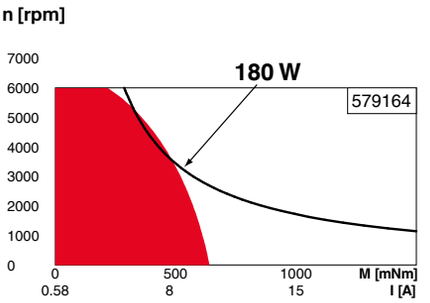
yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V_{Hall} 4.5...24 VDC	Pin 5
	N.C.	Pin 6

Connector	**Article number**
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 49

[1]Calculation does not include saturation effect (p. 61/168)

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

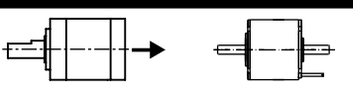
Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 36

Planetary Gearhead
∅52 mm
4 - 30 Nm
Page 402



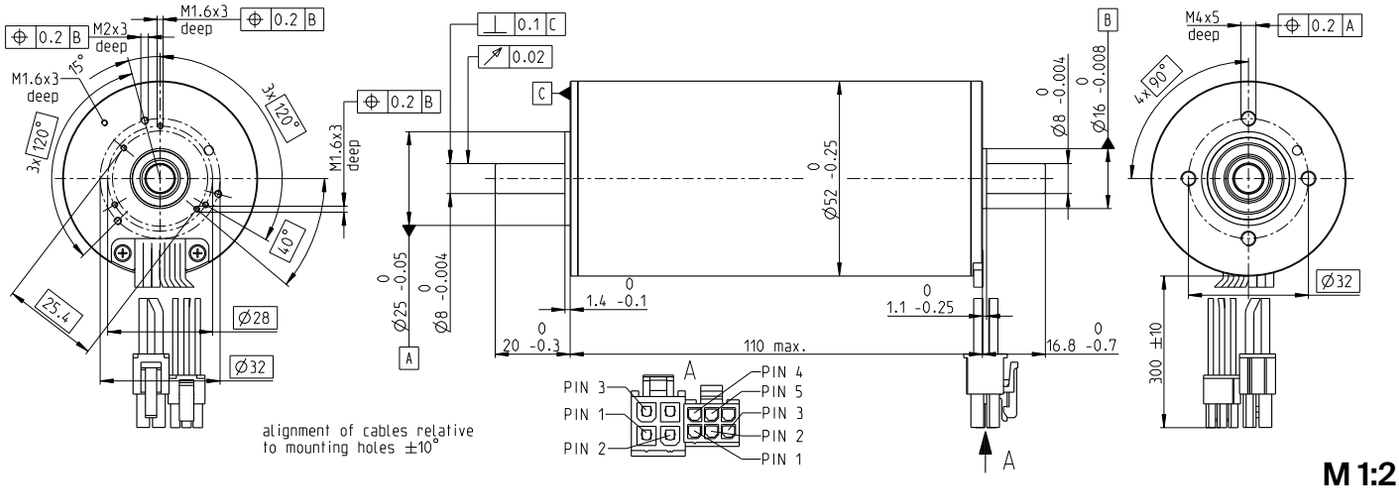
Recommended Electronics:

Notes	Page **36**
ESCON Mod. 50/8 (HE)	488
ESCON 70/10	489
EPOS4 Mod./Comp. 50/8	497
EPOS4 Mod./Comp. 50/15	497
EPOS4 70/15	501

Encoder 16 EASY/XT
128 - 1024 CPT, 3 channels
Page 450/452
Encoder 16 EASY Absolute/XT
4096 steps
Page 454/456
Encoder 16 RIO
1024 - 32768 CPT, 3 channels
Page 467
Encoder AEDL 5810
1024 - 5000 CPT, 3 channels
Page 470
Encoder HEDL 5540
500 CPT, 3 channels
Page 477

EC-i 52 ∅52 mm, brushless, 200 Watt

High Torque



M 1:2

Stock program
Standard program
Special program (on request)

			Part Numbers		
		with Hall sensors	606793	596099	634043
Motor Data (provisional)					
	Values at nominal voltage				
1	Nominal voltage	V	24	36	48
2	No load speed	rpm	3340	3660	3970
3	No load current	mA	657	499	419
4	Nominal speed	rpm	2970	3300	3610
5	Nominal torque (max. continuous torque)	mNm	640	649	622
6	Nominal current (max. continuous current)	A	9.36	6.93	5.44
7	Stall torque[1]	mNm	13800	18800	22900
8	Stall current	A	202	202	200
9	Max. efficiency	%	89	90.4	91.1
	Characteristics				
10	Terminal resistance phase to phase	Ω	0.119	0.178	0.24
11	Terminal inductance phase to phase	mH	0.149	0.28	0.424
12	Torque constant	mNm/A	68	93.1	115
13	Speed constant	rpm/V	140	103	83.3
14	Speed/torque gradient	rpm/mNm	0.245	0.196	0.174
15	Mechanical time constant	ms	0.677	0.543	0.482
16	Rotor inertia	gcm²	264	264	264

Specifications

Thermal data

17	Thermal resistance housing-ambient	4.02 K/W
18	Thermal resistance winding-housing	0.53 K/W
19	Thermal time constant winding	12.8 s
20	Thermal time constant motor	2310 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+155°C

Mechanical data (preloaded ball bearings)

23	Max. permissible speed		5000 rpm
24	Axial play at axial load	< 15 N	0 mm
		> 15 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		12 N
27	Max. force for press fits (static)		150N
	(static, shaft supported)		6000 N
28	Max. radial load, 5 mm from flange		110 N

Other specifications

29	Number of pole pairs	8
30	Number of phases	3
31	Weight of motor	1150 g

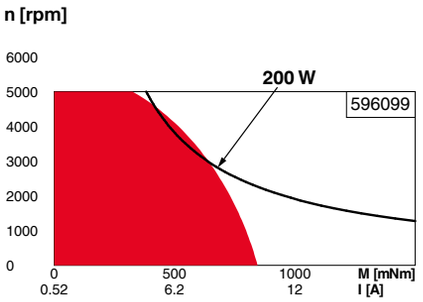
Values listed in the table are nominal.

Connection	**motor** (Cable AWG 16)	
red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4
Connector	**Article number**	
Molex	39-01-2040	
Connection	**sensor** (Cable AWG 26)	
yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V_{Hall} 4.5...24 VDC	Pin 5
	N.C.	Pin 6
Connector	**Article number**	
Molex	430-25-0600	

Wiring diagram for Hall sensors see p. 49

[1]Calculation does not include saturation effect (p. 61/168)

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

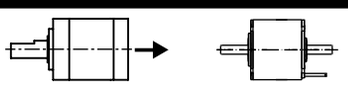
Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 36

Planetary Gearhead
∅52 mm
4 - 30 Nm
Page 402



Recommended Electronics:

Notes	Page **36**
ESCON Mod. 50/8 (HE)	488
ESCON 70/10	489
EPOS4 Mod./Comp. 50/8	497
EPOS4 Mod./Comp. 50/15	497
EPOS4 70/15	501

Encoder 16 EASY/XT
128 - 1024 CPT, 3 channels
Page 450/452
Encoder 16 EASY Absolute/XT
4096 steps
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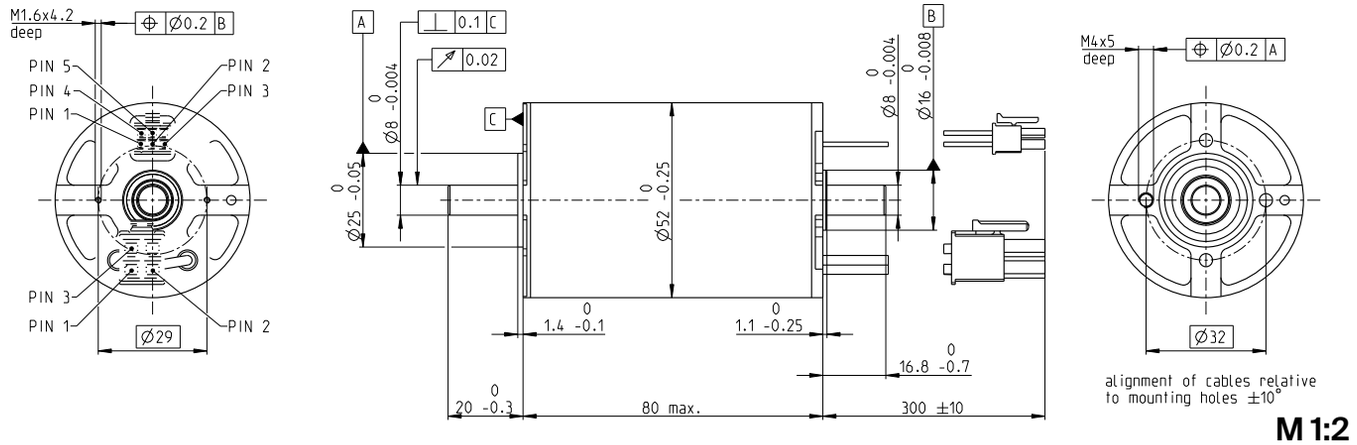
Encoder 16 RIO
1024 - 32768 CPT, 3 channels
Page 467
Encoder AEDL 5810
1024 - 5000 CPT, 3 channels
Page 470
Encoder HEDL 5540
500 CPT, 3 channels
Page 477

EC-i 52 ∅52 mm, brushless, 250 Watt

Open Motor

NEW

EC-i



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

	with Hall sensors	667060	667061	667062	667063
Motor Data					
	Values at nominal voltage				
1	Nominal voltage	V	18	24	36	48
2	No load speed	rpm	4450	4860	5010	5090
3	No load current	mA	829	707	493	379
4	Nominal speed	rpm	3840	4220	4360	4440
5	Nominal torque (max. continuous torque)	mNm	520	534	564	544
6	Nominal current (max. continuous current)	A	13.1	10.9	7.89	5.83
7	Stall torque[1]	mNm	10300	12800	15600	15300
8	Stall current	A	269	274	229	171
9	Max. efficiency	%	89.3	90.2	91	90.9
	Characteristics					
10	Terminal resistance phase to phase	Ω	0.0668	0.0876	0.157	0.281
11	Terminal inductance phase to phase	mH	0.0826	0.123	0.261	0.45
12	Torque constant	mNm/A	38.2	46.7	68	89.2
13	Speed constant	rpm/V	250	204	140	107
14	Speed/torque gradient	rpm/mNm	0.436	0.383	0.325	0.337
15	Mechanical time constant	ms	0.776	0.681	0.578	0.599
16	Rotor inertia	gcm²	170	170	170	170

Specifications

Thermal data

17	Thermal resistance housing-ambient	4.09 K/W
18	Thermal resistance winding-housing	0.641 K/W
19	Thermal time constant winding	23.1 s
20	Thermal time constant motor	1530 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+155°C

Mechanical data (preloaded ball bearings)

23	Max. speed		6000 rpm
24	Axial play at axial load	< 9.0 N	0 mm
		> 9.0 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		12 N
27	Max. force for press fits (static)		150 N
	(static, shaft supported)		6000 N
28	Max. radial load, 5 mm from flange		110 N

Other specifications

29	Number of pole pairs	8
30	Number of phases	3
31	Weight of motor	750 g

Values listed in the table are nominal.

Connection motor (Cable AWG 16)

red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

Connector	**Article number**
Molex	171692-0104

Connection sensor (Cable AWG 26)

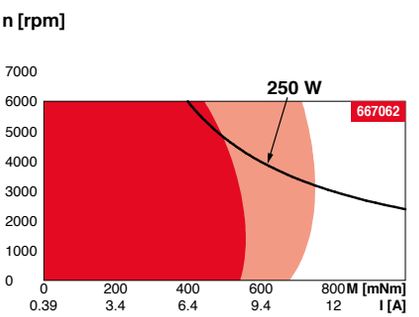
yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V_{Hall} 4.5...24 VDC	Pin 5
	N.C.	Pin 6

Connector	**Article number**
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 49

[1]Calculation does not include saturation effect (p. 61/168)

Operating Range



Comments

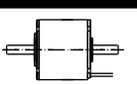
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 36



Recommended Electronics:

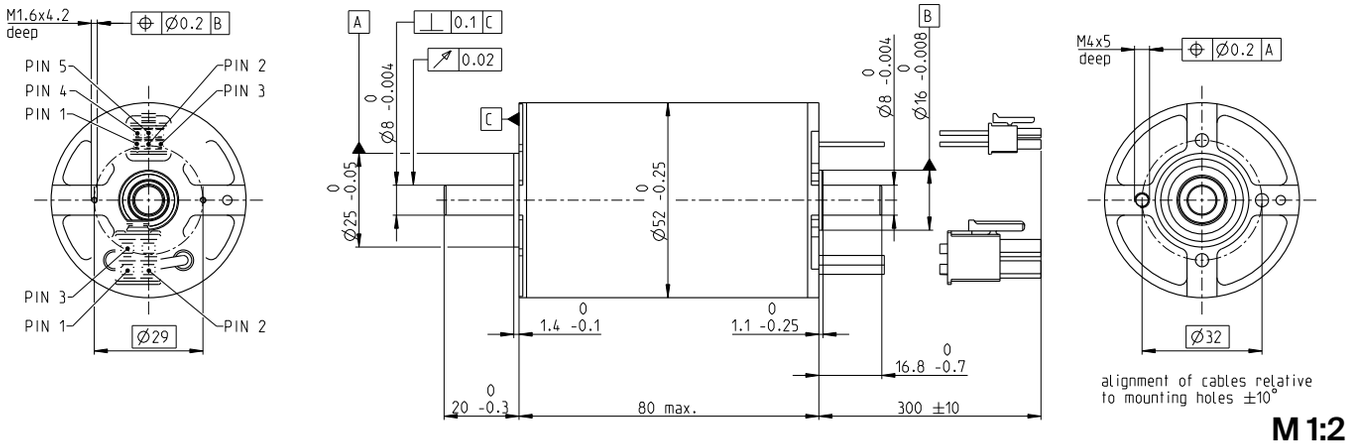
Notes	Page **36**
ESCON Mod. 50/8 (HE)	488
ESCON 70/10	489
EPOS4 Mod./Comp. 50/8	497
EPOS4 Mod./Comp. 50/15	497
EPOS4 70/15	501

Encoder 16 EASY
128 - 1024 CPT, 3 channels
Page 450
Encoder 16 EASY XT
128 - 1024 CPT, 3 channels
Page 452
Encoder 16 EASY Absolute
4096 steps
Page 454
Encoder 16 EASY Absolute XT
4096 steps
Page 456
Encoder 16 RIO
1024 - 32768 CPT, 3 channels
Page 467

EC-i 52 ∅52 mm, brushless, 420 Watt

Ventilated

NEW



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

with Hall sensors	667064	667065	667066	633919
Motor Data				
Values at nominal voltage				
1 Nominal voltage V	18	24	36	48
2 No load speed rpm	4450	4860	5010	5090
3 No load current mA	829	707	493	379
4 Nominal speed rpm	3470	3800	3920	3990
5 Nominal torque (max. continuous torque) mNm	896	964	1040	1010
6 Nominal current (max. continuous current) A	20.8	18.1	13.2	9.87
7 Stall torque[1] mNm	10300	12800	15600	15300
8 Stall current A	269	274	229	171
9 Max. efficiency %	89.3	90.2	91	90.9
Characteristics				
10 Terminal resistance phase to phase Ω	0.0668	0.0876	0.157	0.281
11 Terminal inductance phase to phase mH	0.0826	0.123	0.261	0.45
12 Torque constant mNm/A	38.2	46.7	68	89.2
13 Speed constant rpm/V	250	204	140	107
14 Speed/torque gradient rpm/mNm	0.436	0.383	0.325	0.337
15 Mechanical time constant ms	0.776	0.681	0.578	0.599
16 Rotor inertia gcm²	170	170	170	170

Specifications

Thermal data

17	Thermal resistance housing-ambient	1.77 K/W
18	Thermal resistance winding-housing	0.34 K/W
19	Thermal time constant winding	12.2 s
20	Thermal time constant motor	667 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+155°C

Mechanical data (preloaded ball bearings)

23	Max. speed		6000 rpm
24	Axial play at axial load	< 9.0 N	0 mm
		> 9.0 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		12 N
27	Max. force for press fits (static)		150 N
	(static, shaft supported)		6000 N
28	Max. radial load, 5 mm from flange		110 N

Other specifications

29	Number of pole pairs	8
30	Number of phases	3
31	Weight of motor	752 g

Values listed in the table are nominal.

Connection motor (Cable AWG 16)

red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

Connector	**Article number**
Molex	171692-0104

Connection sensor (Cable AWG 26)

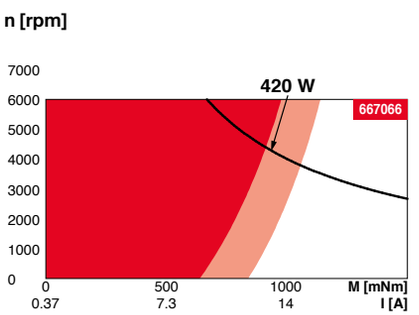
yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V_{Hall} 4.5...24 VDC	Pin 5
	N.C.	Pin 6

Connector	**Article number**
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 49

[1]Calculation does not include saturation effect (p. 61/168)

Operating Range



Comments

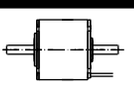
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 36



Recommended Electronics:

Notes	Page **36**
ESCON 70/10	489
EPOS4 Mod./Comp. 50/15	497
EPOS4 70/15	501

Encoder 16 EASY
128 - 1024 CPT, 3 channels
Page 450
Encoder 16 EASY XT
128 - 1024 CPT, 3 channels
Page 452
Encoder 16 EASY Absolute
4096 steps
Page 454
Encoder 16 EASY Absolute XT
4096 steps
Page 456
Encoder 16 RIO
1024 - 32768 CPT, 3 channels
Page 467

For your personal notes

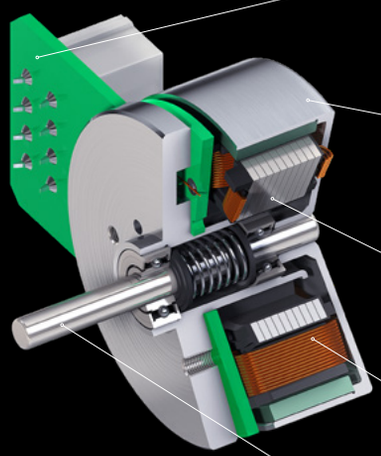
maxon EC flat

maxon EC flat

maxon flat motors are especially suitable for installation in confined spaces. The brushless motors are designed as internal and external rotors and can reach speeds of up to 20 000 rpm. The simple design makes it possible to automate the manufacturing – which is reflective in the price. maxon's EC flat motors are available with hall sensors, sensorless or with integrated electronics. These motors can also be combined with gearheads and encoders.

Key data

Motor ∅	9.2 ... 90 mm
Motor length	8 ... 39.9 mm
Power	0.5 ... 600 W
Nominal torque	up to 1610 mNm
Max. permissible speed	up to 25 000 rpm



Printed circuit board with cable or connector. Some sizes available with integrated encoder. This does not affect the motor's length. An integrated speed controller is also available.

External, multi-pole rotor for high torques. Versions with open rotor and integrated fan are available.

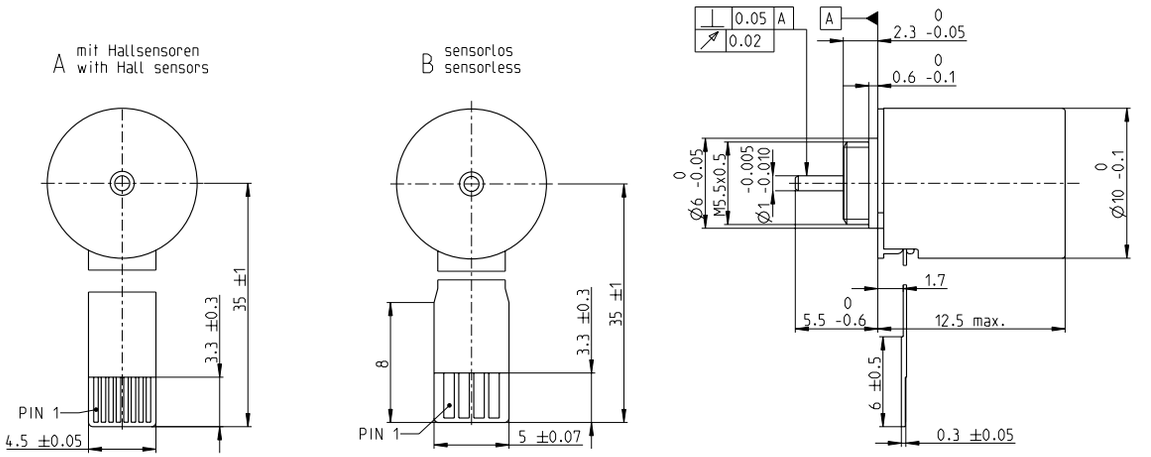
Stator packet optimally connected to the aluminum flange, for ideal heat dissipation.

Precision-manufactured winding for optimal fill factors.

Grooveless shaft ensures smooth running and extremely high torsional rigidity.

- → Attractive price/performance ratio
- → External, multi-pole rotor for high torques
- → Open design, for excellent heat dissipation at higher speeds

EC 9.2 flat ∅10 mm, brushless, 0.5 Watt



M 2:1

Stock program
Standard program
Special program (on request)

Part Numbers

A with Hall sensors	624161	624162	624163
B sensorless	371119	371120	371122

Motor Data (provisional)				
	Values at nominal voltage			
1	Nominal voltage	V	3	4.5	6
2	No load speed	rpm	14500	15100	15600
3	No load current	mA	53.9	38.3	30.9
4	Nominal speed	rpm	4830	5260	5240
5	Nominal torque	mNm	0.764	0.809	0.684
6	Nominal current	A	0.447	0.327	0.222
7	Stall torque[1]	mNm	1.22	1.32	1.1
8	Stall current	A	0.675	0.507	0.332
9	Max. efficiency	%	53	54	50
	Characteristics				
10	Terminal resistance phase to phase	Ω	4.44	8.88	18.1
11	Terminal inductance phase to phase	mH	0.12	0.25	0.4
12	Torque constant	mNm/A	1.81	2.61	3.3
13	Speed constant	rpm/V	5270	3660	2890
14	Speed/torque gradient	rpm/mNm	12900	12500	15800
15	Mechanical time constant	ms	32.1	30.9	39.3
16	Rotor inertia	gcm²	0.237	0.237	0.237

Specifications

Thermal data

17	Thermal resistance housing-ambient	49.2 K/W
18	Thermal resistance winding-housing	13.2 K/W
19	Thermal time constant winding	1.47 s
20	Thermal time constant motor	73.8 s
21	Ambient temperature	-20...+85°C
22	Max. winding temperature	+100°C

Mechanical data (preloaded ball bearings)

23	Max. speed		25 000 rpm
24	Axial play at axial load	< 0.35 N	0 mm
		> 0.35 N	0.1 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		0.15 N
27	Max. force for press fits (static)		15 N
	(static, shaft supported)		70 N
28	Max. radial load, 4 mm from flange		0.4 N

Other specifications

29	Number of pole pairs	4
30	Number of phases	3
31	Weight of motor	3 g

Values listed in the table are nominal.

Connection	**with Hall sensors**	**sensorless**
Pin 1	Motor winding 1	Motor winding 1
Pin 2	Motor winding 2	Motor winding 2
Pin 3	Motor winding 3	Motor winding 3
Pin 4	V_{Hall} 3.8...24 VDC	Y
Pin 5	GND	
Pin 6	Hall sensor 1	
Pin 7	Hall sensor 2	
Pin 8	Hall sensor 3	

Output signals: CMOS compatible push-pull stage.

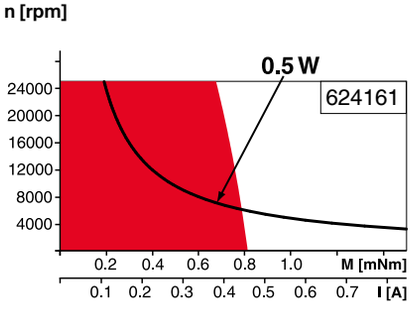
Compatible connector:

Type	**Part number**	**Part number**
Molex	52745-0897	52207-0460
FCI	SFV8R-2STBE1HLF	SFW4R-2STGE1LF

Pin for design with Hall sensors:
FPC, 8-pol, Pitch 0.5 mm, top contact style

Option: Sleeve bearings in place of ball bearings
[1]Calculation does not include saturation effect (p. 61/168)

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

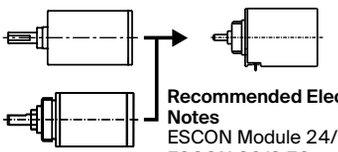
Assigned power rating

maxon Modular System

Details on catalog page 38

Planetary Gearhead
∅10 mm
0.005 - 0.1 Nm
Page 360

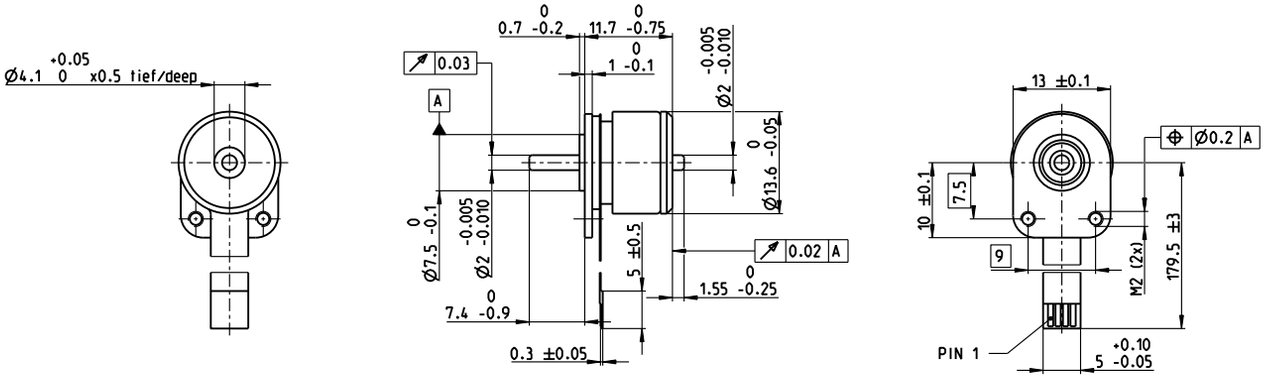
Planetary Gearhead
∅10 mm
0.01 - 0.15 Nm
Page 361



Recommended Electronics:

Notes	Page **38**
ESCON Module 24/2	486
ESCON 36/3 EC	487
ESCON Mod. 50/4 EC-S	487
DEC Module 24/2	491
EPOS4 Mod./Comp. 24/1.5	496

EC 14 flat ∅13.6 mm, brushless, 1.5 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

	sensorless	339251	339252	236679	339253
Motor Data					
	Values at nominal voltage				
1	Nominal voltage	V	6	12	18	24
2	No load speed	rpm	20000	20100	19900	20000
3	No load current	mA	156	78.1	51.7	38.9
4	Nominal speed	rpm	9600	9680	9390	9590
5	Nominal torque (max. continuous torque)	mNm	1.8	1.83	1.74	1.81
6	Nominal current (max. continuous current)	A	0.794	0.402	0.256	0.199
7	Stall torque[1]	mNm	3.79	3.87	3.6	3.8
8	Stall current	A	1.5	0.764	0.474	0.374
9	Max. efficiency	%	49	49	48	49
	Characteristics					
10	Terminal resistance phase to phase	Ω	4.01	15.7	38	64.1
11	Terminal inductance phase to phase	mH	0.107	0.428	0.962	1.71
12	Torque constant	mNm/A	2.53	5.06	7.6	10.1
13	Speed constant	rpm/V	3770	1890	1260	942
14	Speed/torque gradient	rpm/mNm	5980	5860	6270	5960
15	Mechanical time constant	ms	68.9	67.5	72.3	68.6
16	Rotor inertia	gcm²	1.1	1.1	1.1	1.1

Specifications

Thermal data

17	Thermal resistance housing-ambient		11.6 K/W
18	Thermal resistance winding-housing		11.3 K/W
19	Thermal time constant winding		1.37 s
20	Thermal time constant motor		49.2 s
21	Ambient temperature		-40...+100°C
22	Max. winding temperature		+125°C

Mechanical data (preloaded ball bearings)

23	Max. speed		22000 rpm
24	Axial play at axial load	< 1.5 N	0 mm
		> 1.5 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		1.3 N
27	Max. force for press fits (static)		18 N
	(static, shaft supported)		200 N
28	Max. radial load, 5 mm from flange		3.4 N

Other specifications

29	Number of pole pairs	4
30	Number of phases	3
31	Weight of motor	8 g

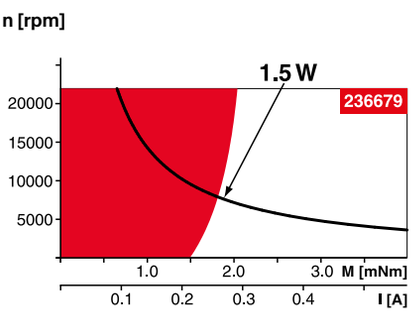
Values listed in the table are nominal.

Connection

Pin 1	Motor winding 1
Pin 2	Motor winding 2
Pin 3	Motor winding 3
Pin 4	⅄ neutral point
Adapter	**Part number**
see p. 514	220310
Connector	**Part number**
TE	84953-4
Molex	52207-0433

[1]Calculation does not include saturation effect (p. 61/168)

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

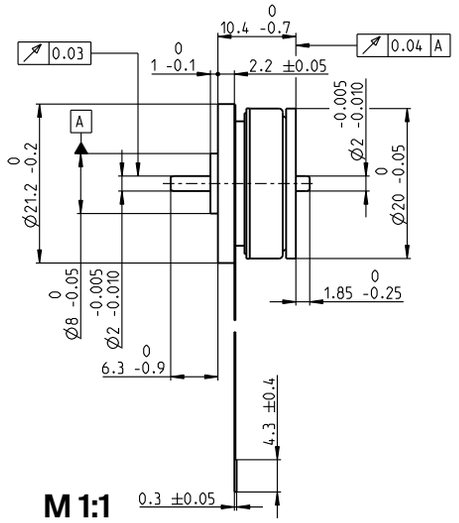
Short term operation
The motor may be briefly overloaded (recurring).

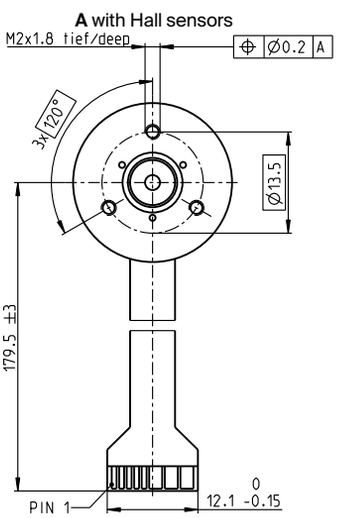
Assigned power rating

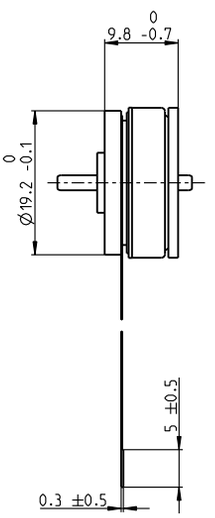
maxon Modular System Details on catalog page 38

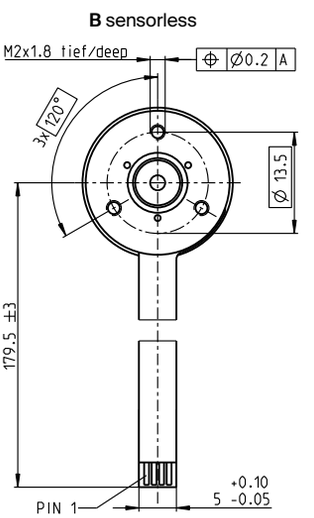
Recommended Electronics:
Notes Page **38**
ESCON Mod. 50/4 EC-S 487

EC 20 flat ∅20 mm, brushless, 3 Watt









EC flat

Stock program
Standard program
Special program (on request)

Part Numbers

A with Hall sensors	351098	351099	351100	351101
B sensorless	339255	241916	339257	339258

Motor Data									
	Values at nominal voltage								
1	Nominal voltage	V	6	9	12	24			
2	No load speed	rpm	9070	9760	9540	9450			
3	No load current	mA	53.6	35.1	25.8	12.6			
4	Nominal speed	rpm	3030	4140	3490	3830			
5	Nominal torque (max. continuous torque)	mNm	3.22	4.08	3.28	3.78			
6	Nominal current (max. continuous current)	A	0.56	0.478	0.294	0.163			
7	Stall torque[1]	mNm	5.29	8.04	5.67	7.12			
8	Stall current	A	0.9	0.957	0.503	0.309			
9	Max. efficiency	%	59	66	61	65			
	Characteristics								
10	Terminal resistance phase to phase	Ω	6.67	9.4	23.9	77.7			
11	Terminal inductance phase to phase	mH	0.639	1.3	2.35	9.8			
12	Torque constant	mNm/A	5.88	8.4	11.3	23			
13	Speed constant	rpm/V	1620	1140	847	414			
14	Speed/torque gradient	rpm/mNm	1840	1270	1790	1400			
15	Mechanical time constant	ms	74.1	51.2	72.1	56.2			
16	Rotor inertia	gcm²	3.84	3.84	3.84	3.84			

Specifications

	Thermal data		
17	Thermal resistance housing-ambient		19.2 K/W
18	Thermal resistance winding-housing		8.41 K/W
19	Thermal time constant winding		3.69 s
20	Thermal time constant motor		31.8 s
21	Ambient temperature		-40...+100°C
22	Max. winding temperature		+125°C
	Mechanical data (preloaded ball bearings)		
23	Max. speed		15000 rpm
24	Axial play at axial load	< 2.0 N	0 mm
		> 2.0 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		1.8 N
27	Max. force for press fits (static)		18 N
	(static, shaft supported)		200 N
28	Max. radial load, 5 mm from flange		1.9 N
	Other specifications		
29	Number of pole pairs		4
30	Number of phases		3
31	Weight of motor		15 g

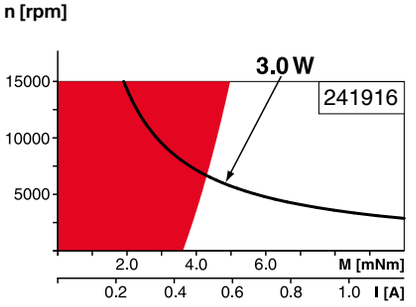
Values listed in the table are nominal.

Connection	with Hall sensors	sensorless
Pin 1	V_{Hall} 4.5...24 VDC	Motor winding 1
Pin 2	Hall sensor 3	Motor winding 2
Pin 3	Hall sensor 1	Motor winding 3
Pin 4	Hall sensor 2	⅄ neutral point
Pin 5	GND	
Pin 6	Motor winding 3	
Pin 7	Motor winding 2	
Pin 8	Motor winding 1	
Adapter	**Part number**	**Part number**
see p. 514	220300	220310
Connector	**Part number**	**Part number**
TE	1-84953-1	84953-4
Molex	52207-1133	52207-0433

Pin for design with Hall sensors:
FPC, 11-pol, Pitch 1.0 mm, top contact style
Wiring diagram for Hall sensors see p. 49

[1]Calculation does not include saturation effect (p. 61/168)

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

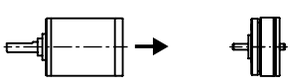
Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 38

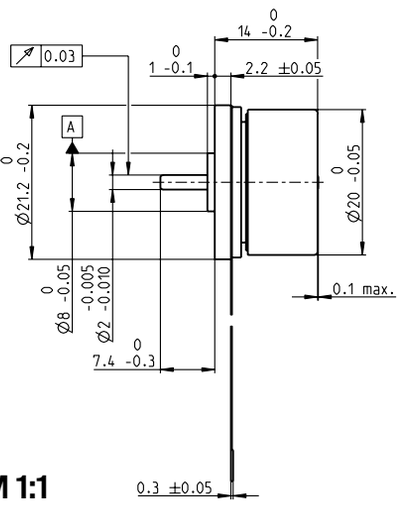
Planetary Gearhead
∅22 mm
0.5 - 2.0 Nm
Page 374/377



Recommended Electronics:

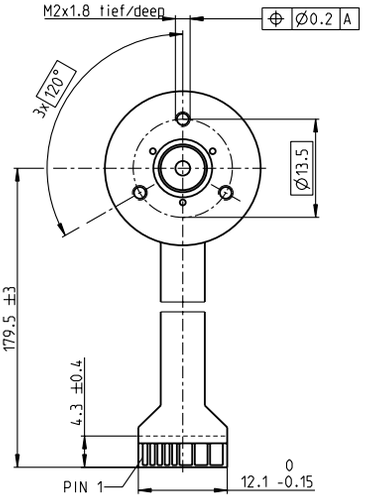
Notes	Page 38
ESCON Module 24/2	486
ESCON 36/3 EC	487
ESCON Mod. 50/4 EC-S	487
DEC Module 24/2	491
EPOS4 Micro 24/5	495
EPOS4 Mod./Comp. 24/1.5	496
EPOS4 Comp. 24/5 3-axes	497

EC 20 flat ∅20 mm, brushless, 5 Watt

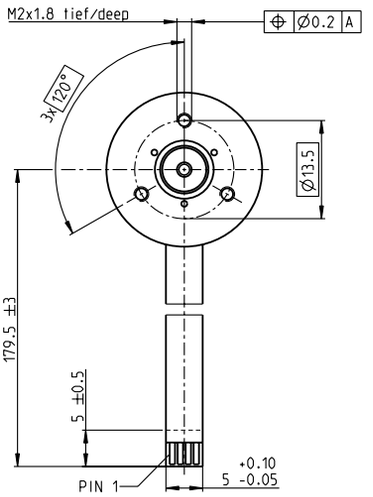


M 1:1

A with Hall sensors



B sensorless



Stock program
Standard program
Special program (on request)

Part Numbers

A with Hall sensors	351005	351006	351007	**351008**
B sensorless	351054	351055	351056	351057

Motor Data (provisional)						
	Values at nominal voltage					
1	Nominal voltage	V	6	9	12	24
2	No load speed	rpm	9350	9430	9380	9300
3	No load current	mA	102	68.3	51.1	25.1
4	Nominal speed	rpm	4780	5310	5170	5220
5	Nominal torque (max. continuous torque)	mNm	7.59	8.58	7.59	7.74
6	Nominal current (max. continuous current)	A	1.31	0.974	0.655	0.329
7	Stall torque[1]	mNm	17.2	22.4	18.9	19.9
8	Stall current	A	2.93	2.54	1.61	0.838
9	Max. efficiency	%	67	71	68	69
	Characteristics					
10	Terminal resistance phase to phase	Ω	2.05	3.54	7.45	28.6
11	Terminal inductance phase to phase	mH	0.189	0.424	0.754	3.09
12	Torque constant	mNm/A	5.88	8.82	11.8	23.8
13	Speed constant	rpm/V	1620	1080	812	402
14	Speed/torque gradient	rpm/mNm	567	435	515	484
15	Mechanical time constant	ms	30.3	23.2	27.5	25.8
16	Rotor inertia	gcm²	5.1	5.1	5.1	5.1

Specifications

Thermal data

17	Thermal resistance housing-ambient	16.5 K/W
18	Thermal resistance winding-housing	2.66 K/W
19	Thermal time constant winding	1.77 s
20	Thermal time constant motor	27.5 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+125°C

Mechanical data (preloaded ball bearings)

23	Max. speed		15000 rpm
24	Axial play at axial load	< 2.0 N	0 mm
		> 2.0 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		1.8 N
27	Max. force for press fits (static)		26 N
	(static, shaft supported)		200 N
28	Max. radial load, 5 mm from flange		5.3 N

Other specifications

29	Number of pole pairs	4
30	Number of phases	3
31	Weight of motor	22 g

Values listed in the table are nominal.

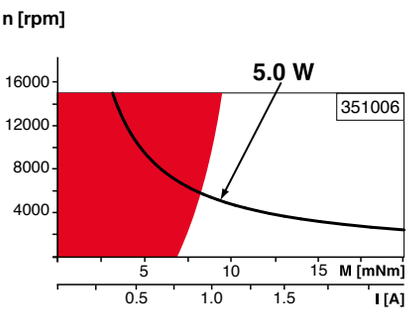
Connection	**with Hall sensors**	**sensorless**
Pin 1	V_{Hall} 4.5...24 VDC	Motor winding 1
Pin 2	Hall sensor 3	Motor winding 2
Pin 3	Hall sensor 1	Motor winding 3
Pin 4	Hall sensor 2	⅄ neutral point
Pin 5	GND	
Pin 6	Motor winding 3	
Pin 7	Motor winding 2	
Pin 8	Motor winding 1	

Adapter	**Part number**	**Part number**
see p. 514	220300	220310
Connector	**Part number**	**Part number**
TE	1-84953-1	84953-4
Molex	52207-1133	52207-0433

Pin for design with Hall sensors:
FPC, 11-pol, Pitch 1.0 mm, top contact style
Wiring diagram for Hall sensors see p. 49

[1]Calculation does not include saturation effect (p. 61/168)

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

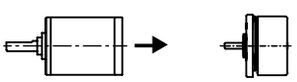
Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 38

Planetary Gearhead
∅22 mm
0.5 - 2.0 Nm
Page 374/377

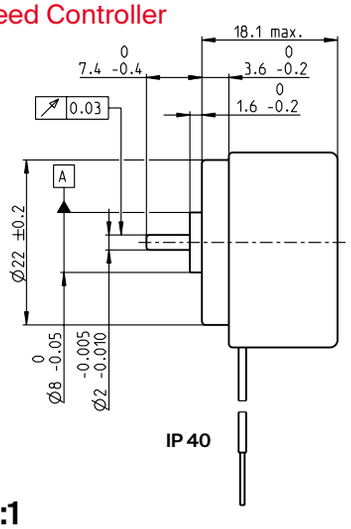


Recommended Electronics:

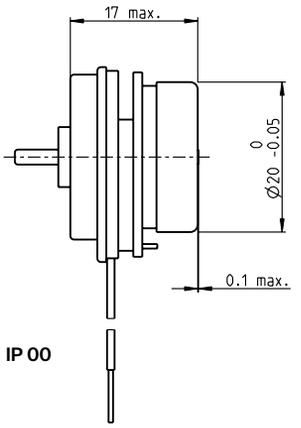
Notes	Page **38**
ESCON Module 24/2	486
ESCON 36/3 EC	487
ESCON Mod. 50/4 EC-S	487
DEC Module 24/2	491
EPOS4 Micro 24/5	495
EPOS4 Mod./Comp. 24/1.5	496
EPOS4 Comp. 24/5 3-axes	497

EC 20 flat brushless, 2 Watt, with integrated electronics

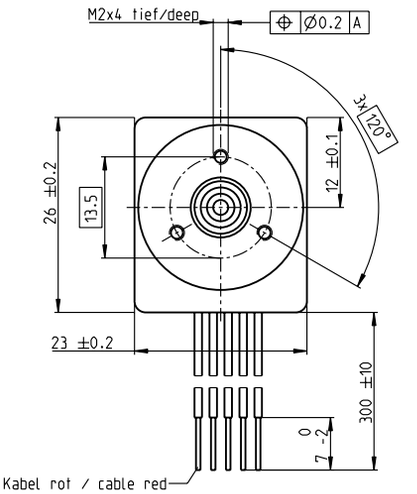
1-Q-Speed Controller



IP 40



IP 00



M 1:1

EC flat

Stock program
Standard program
Special program (on request)

Part Numbers		
	5 wire version	
	Enable	Direction
IP 40 (with cover)	688690	688691
IP 00 (without cover)	688710	688711

Motor Data			
	Values at nominal voltage		
1	Nominal voltage	V	24	24
2	No load speed	rpm	6000	6000
3	No load current	mA	14.7	14.7
4	Nominal speed	rpm	6000	6000
5	Nominal torque (max. continuous torque)	mNm	3.55	3.55
6	Nominal current (max. continuous current)	A	0.208	0.208
33	Max. torque	mNm	6.13	6.13
34	Max. current	A	0.73	0.73
9	Max. efficiency	%	52	52
	Characteristics		
35	Type of control		Speed	Speed
36	Supply voltage $+V_{CC}$	V	10...28	10...28
37	Speed set value input	V	0.33...10.8	0.33...10.8
38	Scale speed set value input	rpm/V	600	600
39	Speed range	rpm	200...6480	200...6480
40	Max. acceleration	rpm/s	6000	6000

Specifications

	Thermal data		
17	Thermal resistance housing-ambient		17.2 K/W
18	Thermal resistance winding-housing		7.98 K/W
19	Thermal time constant winding		2.37 s
20	Thermal time constant motor		132 s
21	Ambient temperature		-40...+85°C
22	Max. winding temperature		+125°C
41	Max. temperature of electronics		+105°C
	Mechanical data (preloaded ball bearings)		
16	Rotor inertia		3.84 gcm²
24	Axial play at axial load	< 2.0 N	0 mm
		> 2.0 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		1.8 N
27	Max. force for press fits (static)		26 N
	(static, shaft supported)		200 N
28	Max. radial load, 5 mm from flange		11 N
	Other specifications		
31	Weight of motor		30 g
32	Direction of rotation		Clockwise (CW)

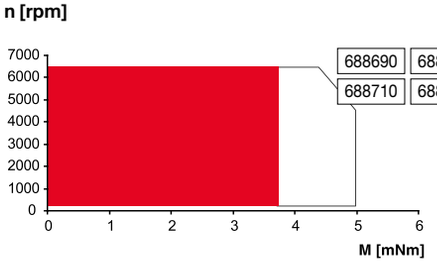
Values listed in the table are nominal.

Protective functions
Overload protection, blockage protection, inverse-polarity protection, thermal overload protection, low/high voltage cut-off

Connection 5 wire version (Cable AWG 28)

red	$+V_{CC}$ 10...28 VDC
black	GND
white	Speed set value input
green	Monitor n (6 pulses per revolution)
grey	Disable (Type Enable) or sense of direction (Type Direction)

Operating Range



Comments

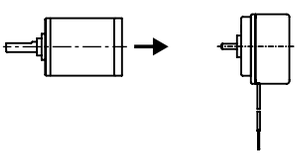
Continuous operation
The drive can be operated with a speed controller and, taking account of the given thermal resistance (fig. 17 and 18) at an ambient temperature of 25°C, does not exceed the maximum permissible operating temperatures.

Overload range
The drive reaches these operating points. Speed may vary from the set value. The overload protection shuts down the drive in the event of sustained overload.

maxon Modular System

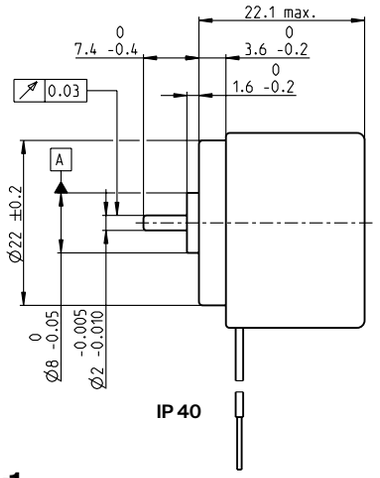
Details on catalog page 38

Planetary Gearhead
∅22 mm
0.5 - 2.0 Nm
Page 374/377

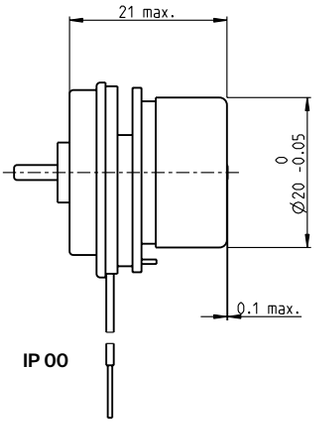


EC 20 flat brushless, 5 Watt, with integrated electronics

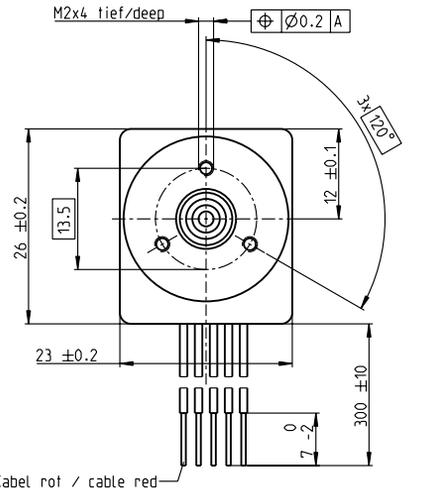
1-Q-Speed Controller



IP 40



IP 00



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

	5 wire version	
	Enable	Direction
IP 40 (with cover)	688692	**688693**
IP 00 (without cover)	688712	688713

Motor Data									
	Values at nominal voltage								
1	Nominal voltage	V	24	24					
2	No load speed	rpm	6000	6000					
3	No load current	mA	32.9	32.9					
4	Nominal speed	rpm	6000	6000					
5	Nominal torque (max. continuous torque)	mNm	7.31	7.31					
6	Nominal current (max. continuous current)	A	0.377	0.377					
33	Max. torque	mNm	13.2	13.2					
34	Max. current	A	0.73	0.73					
9	Max. efficiency	%	54	54					
	Characteristics								
35	Type of control		Speed	Speed					
36	Supply voltage $+V_{CC}$	V	10...28	10...28					
37	Speed set value input	V	0.33...10.8	0.33...10.8					
38	Scale speed set value input	rpm/V	600	600					
39	Speed range	rpm	200...6480	200...6480					
40	Max. acceleration	rpm/s	6000	6000					

Specifications

Thermal data

17	Thermal resistance housing-ambient	10.6 K/W
18	Thermal resistance winding-housing	5.32 K/W
19	Thermal time constant winding	3.66 s
20	Thermal time constant motor	13.9 s
21	Ambient temperature	-40...+85°C
22	Max. winding temperature	+125°C
41	Max. temperature of electronics	+105°C

Mechanical data (preloaded ball bearings)

16	Rotor inertia		5.1 gcm²
24	Axial play at axial load	< 2.0 N	0 mm
		> 2.0 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		1.8 N
27	Max. force for press fits (static)		26 N
	(static, shaft supported)		200 N
28	Max. radial load, 5 mm from flange		12 N

Other specifications

31	Weight of motor	37 g
32	Direction of rotation	Clockwise (CW)

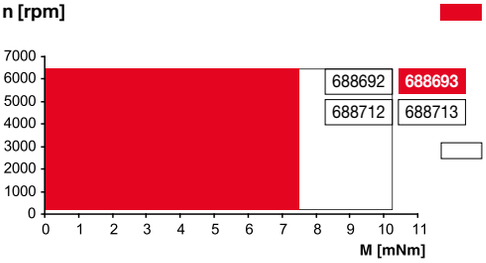
Values listed in the table are nominal.

Protective functions
Overload protection, blockage protection, inverse-polarity protection, thermal overload protection, low/high voltage cut-off

Connection 5 wire version (Cable AWG 28)

red	$+V_{CC}$ 10...28 VDC
black	GND
white	Speed set value input
green	Monitor n (6 pulses per revolution)
grey	Disable (Type Enable) or sense of direction (Type Direction)

Operating Range



Comments

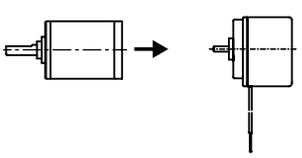
Continuous operation
The drive can be operated with a speed controller and, taking account of the given thermal resistance (fig. 17 and 18) at an ambient temperature of 25°C, does not exceed the maximum permissible operating temperatures.

Overload range
The drive reaches these operating points. Speed may vary from the set value. The overload protection shuts down the drive in the event of sustained overload.

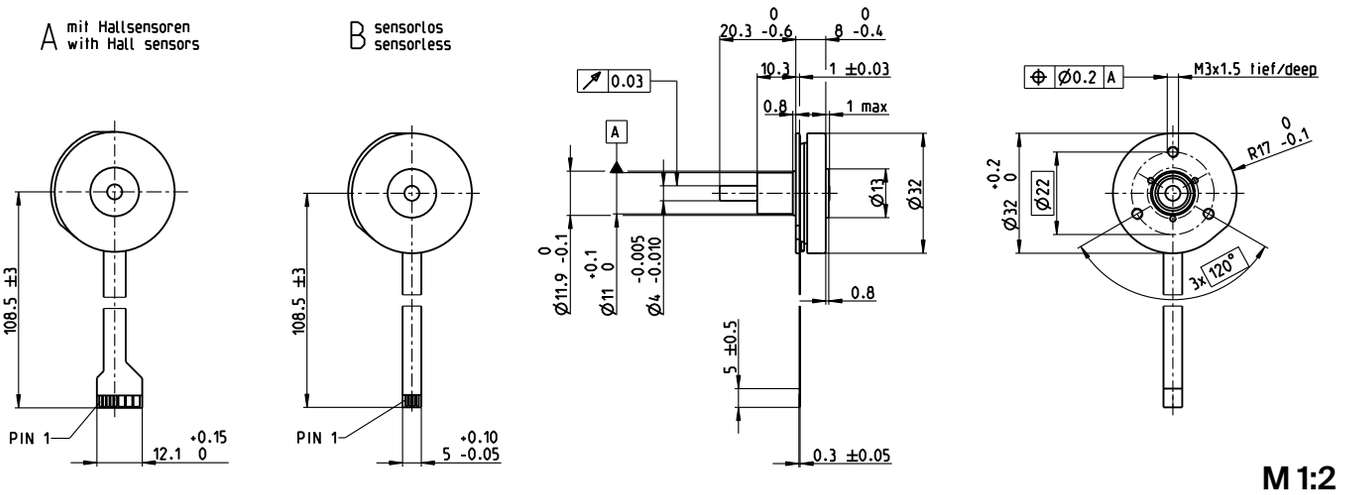
maxon Modular System

Details on catalog page 38

Planetary Gearhead
∅22 mm
0.5 - 2.0 Nm
Page 374/377



EC 32 flat ∅32 mm, brushless, 6 Watt



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers				
A with Hall sensors	339259	200187	339260	339261
B sensorless	339263	200138	339264	339265

Motor Data									
	Values at nominal voltage								
1	Nominal voltage	V	6	9	12	24			
2	No load speed	rpm	9210	8380	7970	9310			
3	No load current	mA	186	107	75.6	46.2			
4	Nominal speed	rpm	3860	3640	3210	4480			
5	Nominal torque (max. continuous torque)	mNm	7.61	8.89	7.98	9.42			
6	Nominal current (max. continuous current)	A	1.37	0.929	0.614	0.401			
7	Stall torque[1]	mNm	15.5	19	15.7	22.8			
8	Stall current	A	2.73	2	1.19	0.995			
9	Max. efficiency	%	55	60	57	62			
	Characteristics								
10	Terminal resistance phase to phase	Ω	2.2	4.5	10.1	24.1			
11	Terminal inductance phase to phase	mH	0.378	1.06	2.04	6.19			
12	Torque constant	mNm/A	5.67	9.5	13.2	23			
13	Speed constant	rpm/V	1680	1010	724	416			
14	Speed/torque gradient	rpm/mNm	651	476	551	437			
15	Mechanical time constant	ms	94.8	69.3	80.3	63.6			
16	Rotor inertia	gcm²	13.9	13.9	13.9	13.9			

Specifications

	Thermal data		
17	Thermal resistance housing-ambient		8.25 K/W
18	Thermal resistance winding-housing		6.21 K/W
19	Thermal time constant winding		3.48 s
20	Thermal time constant motor		22.1 s
21	Ambient temperature		-40...+100°C
22	Max. winding temperature		+125°C
	Mechanical data (preloaded ball bearings)		
23	Max. speed		12000 rpm
24	Axial play at axial load	< 5.0 N	0 mm
		> 5.0 N	typ. 0.6 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		4.8 N
27	Max. force for press fits (static)		45 N
	(static, shaft supported)		1000 N
28	Max. radial load, 15 mm from flange		10.5 N
	Other specifications		
29	Number of pole pairs		4
30	Number of phases		3
31	Weight of motor		32 g

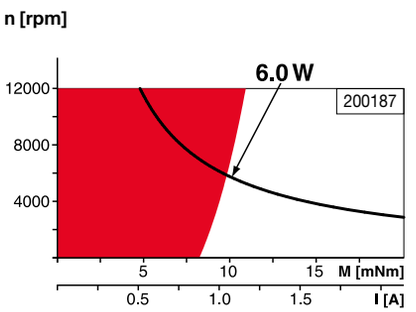
Values listed in the table are nominal.

Connection	with Hall sensors	sensorless
Pin 1	V_{Hall} 3.5...24 VDC	Motor winding 1
Pin 2	Hall sensor 3	Motor winding 2
Pin 3	Hall sensor 1	Motor winding 3
Pin 4	Hall sensor 2	⅄ neutral point
Pin 5	GND	
Pin 6	Motor winding 3	
Pin 7	Motor winding 2	
Pin 8	Motor winding 1	
Adapter see p. 514	**Part number** 220300	**Part number** 220310
Connector	**Part number**	**Part number**
TE	1-84953-1	84953-4
Molex	52207-1133	52207-0433

Pin for design with Hall sensors:
FPC, 11-pol, Pitch 1.0 mm, top contact style
Wiring diagram for Hall sensors see p. 49

[1]Calculation does not include saturation effect (p. 61/168)

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

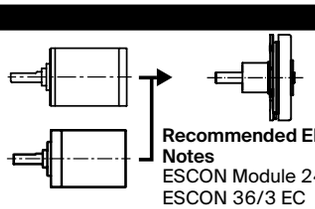
Assigned power rating

maxon Modular System

Details on catalog page 38

Planetary Gearhead
∅22 mm
0.5 - 1.0 Nm
Page 374

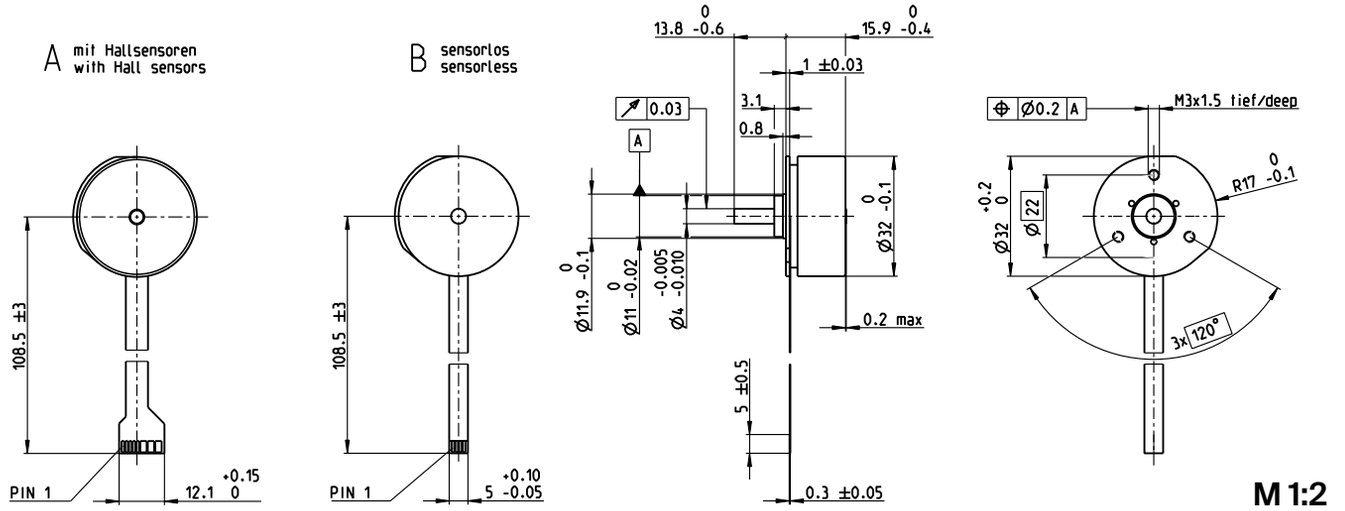
Planetary Gearhead
∅22 mm
0.5 - 2.0 Nm
Page 377



Recommended Electronics:

Notes	Page 38
ESCON Module 24/2	486
ESCON 36/3 EC	487
ESCON Mod. 50/4 EC-S	487
DEC Module 24/2	491
EPOS4 Micro 24/5	495
EPOS4 Mod./Comp. 24/1.5	496
EPOS4 Comp. 24/5 3-axes	497

EC 32 flat ∅32 mm, brushless, 15 Watt



Stock program
Standard program
Special program (on request)

Part Numbers				
A with Hall sensors	339267	339268	267121	339269
B sensorless	339271	339272	226006	339273

Motor Data									
	Values at nominal voltage								
1	Nominal voltage	V	9	12	24	48			
2	No load speed	rpm	3720	4610	4530	4780			
3	No load current	mA	74.7	75.7	36.9	19.9			
4	Nominal speed	rpm	2060	2790	2760	2940			
5	Nominal torque (max. continuous torque)	mNm	24.5	25	25.5	24.7			
6	Nominal current (max. continuous current)	A	1.06	1	0.5	0.257			
7	Stall torque[1]	mNm	68.3	82.3	85.3	83.9			
8	Stall current	A	3.06	3.42	1.74	0.904			
9	Max. efficiency	%	71	73	73	73			
	Characteristics								
10	Terminal resistance phase to phase	Ω	2.95	3.51	13.8	53.1			
11	Terminal inductance phase to phase	mH	1.61	1.86	7.72	27.7			
12	Torque constant	mNm/A	22.4	24.1	49	92.8			
13	Speed constant	rpm/V	427	397	195	103			
14	Speed/torque gradient	rpm/mNm	56.3	57.8	54.8	58.8			
15	Mechanical time constant	ms	20.6	21.2	20.1	21.6			
16	Rotor inertia	gcm²	35	35	35	35			

Specifications

	Thermal data	
17	Thermal resistance housing-ambient	10.8 K/W
18	Thermal resistance winding-housing	4.99 K/W
19	Thermal time constant winding	8.78 s
20	Thermal time constant motor	120 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+125°C
	Mechanical data (preloaded ball bearings)	
23	Max. speed	10 000 rpm
24	Axial play at axial load < 5.0 N	0 mm
	> 5.0 N	typ. 0.6 mm
25	Radial play	preloaded
26	Max. axial load (dynamic)	4.8 N
27	Max. force for press fits (static)	45 N
	(static, shaft supported)	1000 N
28	Max. radial load, 5 mm from flange	14 N
	Other specifications	
29	Number of pole pairs	4
30	Number of phases	3
31	Weight of motor	57 g

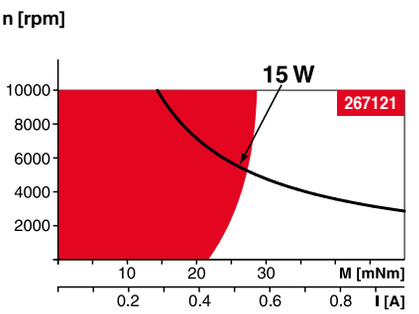
Values listed in the table are nominal.

Connection	with Hall sensors	sensorless
Pin 1	V_{Hall} 3.5...24 VDC	Motor winding 1
Pin 2	Hall sensor 3	Motor winding 2
Pin 3	Hall sensor 1	Motor winding 3
Pin 4	Hall sensor 2	⅄ neutral point
Pin 5	GND	
Pin 6	Motor winding 3	
Pin 7	Motor winding 2	
Pin 8	Motor winding 1	
Adapter see p. 514	**Part number** 220300	**Part number** 220310
Connector	**Part number**	**Part number**
TE	1-84953-1	84953-4
Molex	52207-1133	52207-0433

Pin for design with Hall sensors:
FPC, 11-pol, Pitch 1.0 mm, top contact style
Wiring diagram for Hall sensors see p. 49

[1]Calculation does not include saturation effect (p. 61/168)

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 38

Planetary Gearhead
∅32 mm
0.75 - 6 Nm
Page 385/388

Spur Gearhead
∅38 mm
0.1 - 0.6 Nm
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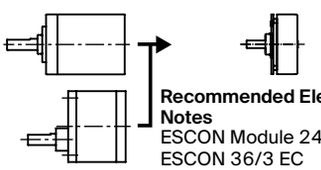
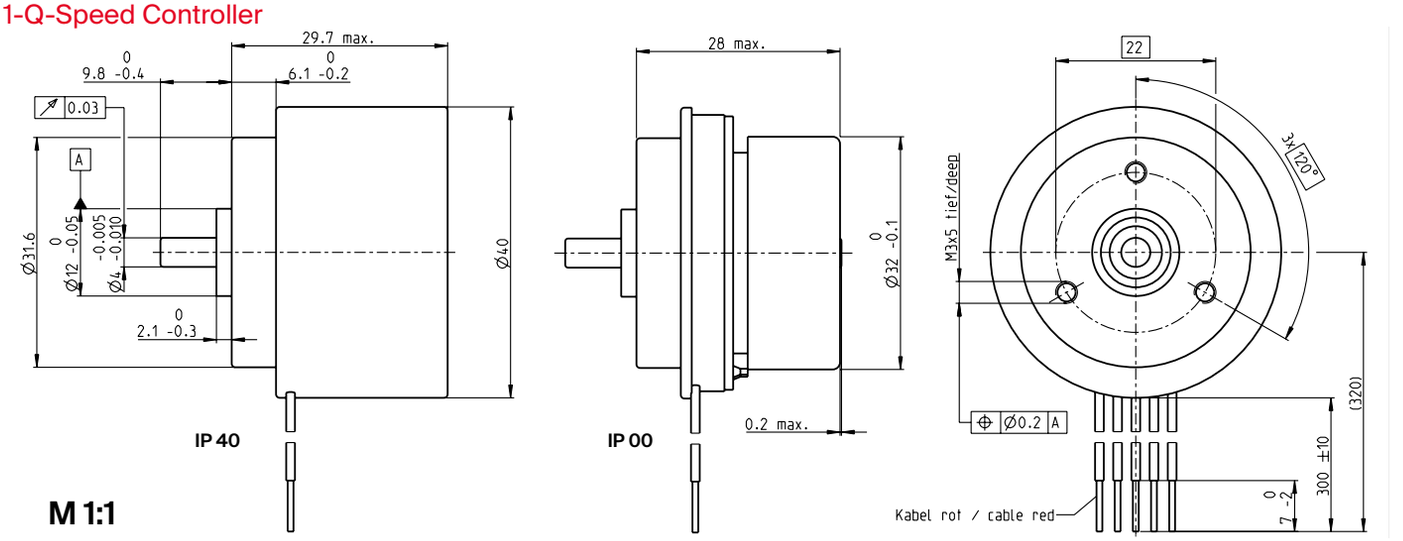


Recommended Electronics:

Notes	Page 38
ESCON Module 24/2	486
ESCON 36/3 EC	487
ESCON Mod. 50/4 EC-S	487
ESCON Module 50/5	487
ESCON 50/5	489
DEC Module 24/2	491
DEC Module 50/5	491
EPOS4 Micro 24/5	495
EPOS4 Mod./Comp. 24/1.5	496
EPOS4 Mod./Comp. 50/5	496
EPOS4 Comp. 24/5 3-axes	497
EPOS4 50/5	501

EC 32 flat brushless, 15 Watt, with integrated electronics

1-Q-Speed Controller



Stock program
Standard program
Special program (on request)

Part Numbers	2 wire version		5 wire version	
			Enable	Direction
IP 40 (with cover)	353400	353401	353399	**370418**
IP 00 (without cover)	353324	353325	349801	370417

Motor Data						
	Values at nominal voltage					
1	Nominal voltage	V	24	24	24	24
2	No load speed	rpm	3000	6000	6000	6000
3	No load current	mA	44.8	84.6	84.6	84.6
4	Nominal speed	rpm	3000	6000	6000	6000
5	Nominal torque (max. continuous torque)	mNm	18.8	18.6	18.6	18.6
6	Nominal current (max. continuous current)	A	0.44	0.741	0.741	0.741
33	Max. torque	mNm	35.8	35.8	35.8	35.8
34	Max. current	A	1.6	1.6	1.6	1.6
9	Max. efficiency	%	58	66	66	66
	Characteristics					
35	Type of control		Speed	Speed	Speed	Speed
36	Supply voltage $+V_{CC}$	V	10...28	10...28	10...28	10...28
37	Speed set value input	V	= V_{CC}	= V_{CC}	0.33...10.8	0.33...10.8
38	Scale speed set value input	rpm/V	125	250	600	600
39	Speed range	rpm	1250...3500	2500...7000	200...6480	200...6480
40	Max. acceleration	rpm/s	3000	6000	6000	6000

Specifications

Thermal data

17	Thermal resistance housing-ambient	7.24 K/W
18	Thermal resistance winding-housing	4.99 K/W
19	Thermal time constant winding	8.69 s
20	Thermal time constant motor	80.5 s
21	Ambient temperature	-40...+85°C
22	Max. winding temperature	+125°C
41	Max. temperature of electronics	+105°C

Mechanical data (preloaded ball bearings)

16	Rotor inertia		35 gcm²
24	Axial play at axial load	< 7.0 N	0 mm
		> 7.0 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		6.8 N
27	Max. force for press fits (static)		95 N
	(static, shaft supported)		1000 N
28	Max. radial load, 5 mm from flange		37 N

Other specifications

31	Weight of motor	91 g
32	Direction of rotation	Clockwise (CW)

Values listed in the table are nominal.

Protective functions
Overload protection, blockage protection, inverse-polarity protection, thermal overload protection, low/high voltage cut-off

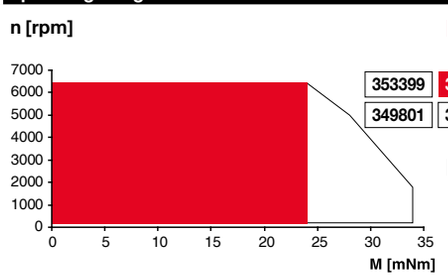
Connection 2 wire version (Cable AWG 24)

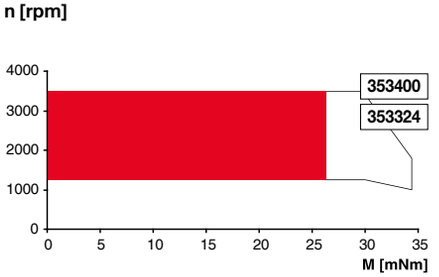
red	$+V_{CC}$ 10...28 VDC
black	GND

Connection 5 wire version (Cable AWG 24)

red	$+V_{CC}$ 10...28 VDC
black	GND
white	Speed set value input
green	Monitor n (6 pulses per revolution)
grey	Disable (Type Enable) or sense of direction (Type Direction)

Operating Range

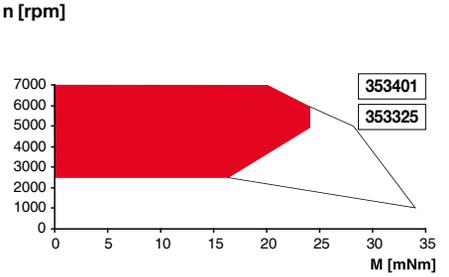




Comments

Continuous operation
The drive can be operated with a speed controller and, taking account of the given thermal resistance (fig. 17 and 18) at an ambient temperature of 25°C, does not exceed the maximum permissible operating temperatures.

Overload range
The drive reaches these operating points. Speed may vary from the set value. The overload protection shuts down the drive in the event of sustained overload.



maxon Modular System

Details on catalog page 38

Planetary Gearhead
∅32 mm
0.75 - 6 Nm
Page 385/388

Spur Gearhead
∅38 mm
0.1 - 0.6 Nm
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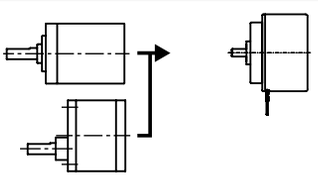
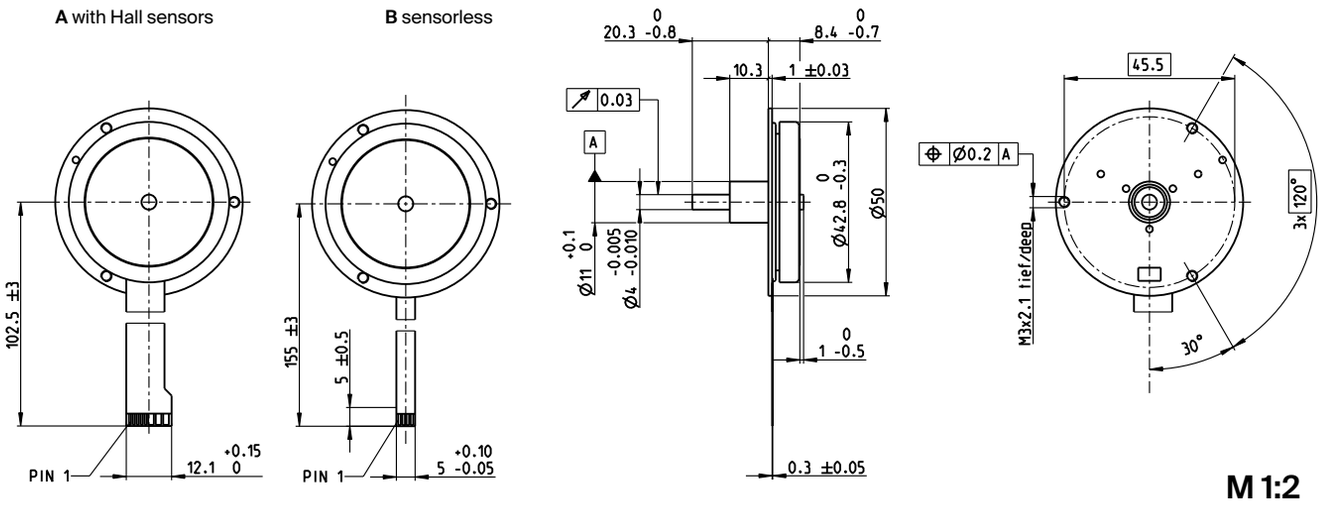


EC 45 flat ∅42.8 mm, brushless, 12 Watt



Stock program
Standard program
Special program (on request)

Part Numbers

A with Hall sensors	200188		339275		339276						
B sensorless		200141		339277		339278					
Motor Data											
	Values at nominal voltage										
1	Nominal voltage	V	9	9	12	12	24	24			
2	No load speed	rpm	8000	7980	8160	8150	7310	7300			
3	No load current	mA	147	147	115	115	47.6	47.6			
4	Nominal speed	rpm	4780	4540	4840	4720	4390	4360			
5	Nominal torque (max. continuous torque)	mNm	23.8	23.6	20.1	20	27	27.1			
6	Nominal current (max. continuous current)	A	2.04	2.04	1.37	1.37	0.766	0.768			
7	Stall torque[1]	mNm	92.6	80.6	70.8	66.5	114	112			
8	Stall current	A	8.9	7.75	5.24	4.92	3.74	3.67			
9	Max. efficiency	%	77	75	73	73	79	79			
	Characteristics										
10	Terminal resistance phase to phase	Ω	1.01	1.16	2.29	2.44	6.42	6.54			
11	Terminal inductance phase to phase	mH	0.32	0.32	0.541	0.541	2.75	2.75			
12	Torque constant	mNm/A	10.4	10.4	13.5	13.5	30.5	30.5			
13	Speed constant	rpm/V	918	918	706	706	313	313			
14	Speed/torque gradient	rpm/mNm	89.3	103	120	128	65.9	67.1			
15	Mechanical time constant	ms	48.9	56.1	65.5	69.8	36.1	36.8			
16	Rotor inertia	gcm²	52.3	52.3	52.3	52.3	52.3	52.3			

Specifications

Thermal data

17	Thermal resistance housing-ambient	6.59 K/W
18	Thermal resistance winding-housing	5.56 K/W
19	Thermal time constant winding	8.36 s
20	Thermal time constant motor	188 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+125°C

Mechanical data (preloaded ball bearings)

23	Max. speed		10000 rpm
24	Axial play at axial load	< 5.0 N	0 mm
		> 5.0 N	typ. 0.6 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		4.8 N
27	Max. force for press fits (static)		45 N
	(static, shaft supported)		1000 N
28	Max. radial load, 15 mm from flange		12.5 N

Other specifications

29	Number of pole pairs	8
30	Number of phases	3
31	Weight of motor	57 g

Values listed in the table are nominal.

Connection	with Hall sensors	sensorless
Pin 1	V_{Hall} 4.5...18 VDC	Motor winding 1
Pin 2	Hall sensor 3*	Motor winding 2
Pin 3	Hall sensor 1*	Motor winding 3
Pin 4	Hall sensor 2*	⅄ neutral point
Pin 5	GND	
Pin 6	Motor winding 3	
Pin 7	Motor winding 2	
Pin 8	Motor winding 1	

*Internal pull-up (7...13 kΩ) on V_{Hall}

Wiring diagram for Hall sensors see p. 49

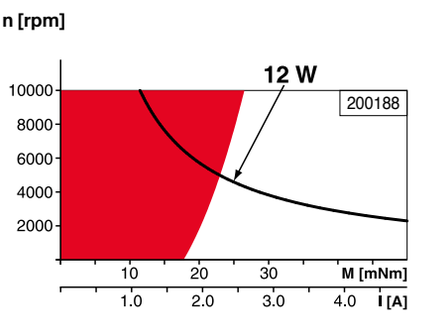
Adapter	Part number	Part number
see p. 514	220300	220310

Connector	Part number	Part number
TE	1-84953-1	84953-4
Molex	52207-1133	52207-0433

Pin for design with Hall sensors:
FPC, 11-pol, Pitch 1.0 mm, top contact style

[1]Calculation does not include saturation effect (p. 61/168)

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 38

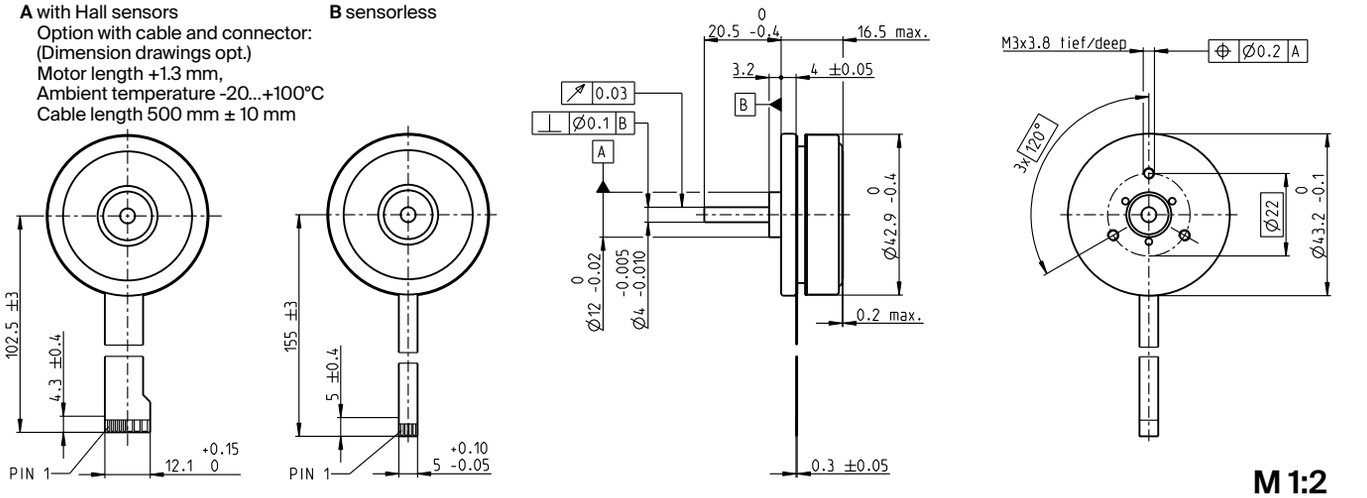
Recommended Electronics:

Notes	Page 38
ESCON Module 24/2	486
ESCON 36/3 EC	487
ESCON Mod. 50/4 EC-S	487
DEC Module 24/2	491
EPOS4 Micro 24/5	495
EPOS4 Mod./Comp. 24/1.5	496
EPOS4 Mod./Comp. 50/5	496
EPOS4 Comp. 24/5 3-axes	497
EPOS4 50/5	501

EC 45 flat ∅42.9 mm, brushless, 30 Watt

A with Hall sensors
Option with cable and connector:
(Dimension drawings opt.)
Motor length +1.3 mm,
Ambient temperature -20...+100°C
Cable length 500 mm ± 10 mm

B sensorless



M 1:2

Stock program
Standard program
Special program (on request)

	Part Numbers							
A with Hall sensors	200142		339281		339282			
Option with Cable and Connector	668555		668556		668557			
B sensorless		200189		339283		339284		
Motor Data								
Values at nominal voltage								
1 Nominal voltage V	12	12	24	24	36	36		
2 No load speed rpm	4370	4350	4360	4380	4750	4760		
3 No load current mA	163	163	81.4	73	61.6	55.3		
4 Nominal speed rpm	2940	2800	2940	2900	3290	3270		
5 Nominal torque (max. continuous torque) mNm	55	54.7	54.8	55.2	66	66.6		
6 Nominal current (max. continuous current) A	2.02	2.02	1.01	1.01	0.847	0.849		
7 Stall torque[1] mNm	255	219	253	243	380	369		
8 Stall current A	10	8.58	4.97	4.77	5.38	5.22		
9 Max. efficiency %	76	75	76	77	80	81		
Characteristics								
10 Terminal resistance phase to phase Ω	1.2	1.4	4.83	5.03	6.69	6.89		
11 Terminal inductance phase to phase mH	0.56	0.56	2.24	2.24	4.29	4.29		
12 Torque constant mNm/A	25.5	25.5	51	51	70.6	70.6		
13 Speed constant rpm/V	374	374	187	187	135	135		
14 Speed/torque gradient rpm/mNm	17.6	20.5	17.7	18.5	12.8	13.2		
15 Mechanical time constant ms	17.1	19.9	17.2	17.9	12.4	12.8		
16 Rotor inertia gcm²	92.5	92.5	92.5	92.5	92.5	92.5		

Specifications

Thermal data

17	Thermal resistance housing-ambient	6.69 K/W
18	Thermal resistance winding-housing	3.92 K/W
19	Thermal time constant winding	11.4 s
20	Thermal time constant motor	295 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+125°C

Mechanical data (preloaded ball bearings)

23	Max. speed		10 000 rpm
24	Axial play at axial load	< 5.0 N	0 mm
		> 5.0 N	typ. 0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		4.8 N
27	Max. force for press fits (static)		53 N
	(static, shaft supported)		1000 N
28	Max. radial load, 5 mm from flange		18 N

Other specifications

29	Number of pole pairs	8
30	Number of phases	3
31	Weight of motor	75 g

Values listed in the table are nominal.

Connection	with Hall sensors	sensorless
Pin 1	V_{Hall} 4.5...18 VDC	Motor winding 1
Pin 2	Hall sensor 3*	Motor winding 2
Pin 3	Hall sensor 1*	Motor winding 3
Pin 4	Hall sensor 2*	⅄ neutral point
Pin 5	GND	
Pin 6	Motor winding 3	
Pin 7	Motor winding 2	
Pin 8	Motor winding 1	

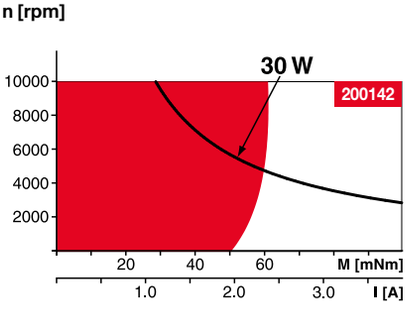
*Internal pull-up (7..13 kΩ) on V_{Hall}
Wiring diagram for Hall sensors see p. 49

Adapter	Part number	Part number
see p. 514	220300	220310
Connector	**Part number**	**Part number**
TE	1-84953-1	84953-4
Molex	52207-1133	52207-0433

Pin for design with Hall sensors:
FPC, 11-pol, Pitch 1.0 mm, top contact style

[1]Calculation does not include saturation effect (p. 61/168)

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

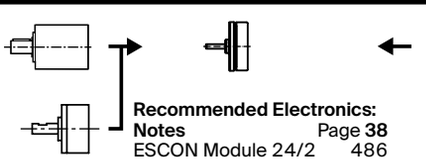
Assigned power rating

maxon Modular System

Details on catalog page 38

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 398

Spur Gearhead
∅45 mm
0.5 - 2.0 Nm
Page 400



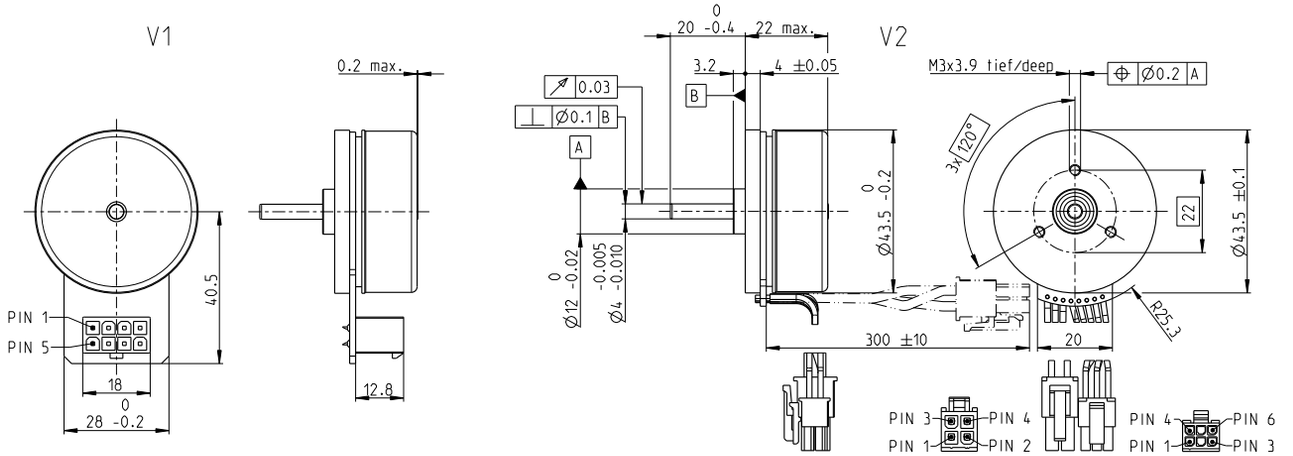
Recommended Electronics:

Notes	Page 38
ESCON Module 24/2	486
ESCON 36/3 EC	487
ESCON Mod. 50/4 EC-S	487
ESCON Module 50/5	487
ESCON 50/5	489
DEC Module 24/2	491
DEC Module 50/5	491
EPOS4 Micro 24/5	495
EPOS4 Mod./Comp. 24/1.5	496
EPOS4 Mod./Comp. 50/5	496
EPOS4 Comp. 24/5 3-axes	497
EPOS4 50/5	501
EPOS2 P 24/5	504

for motor type A:
Encoder MILE
256 - 2048 CPT,
2 channels
Page 446

EC 45 flat ∅43.5 mm, brushless, 50 Watt

NEW



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

V1 with Hall sensors	651606	**651607**	651608	**651609**
V2 with Hall sensors and cables	651610	651611	651612	651613

Motor Data

	Values at nominal voltage					
1	Nominal voltage	V	18	24	36	48
2	No load speed	rpm	5740	6250	6060	5740
3	No load current	mA	277	238	151	104
4	Nominal speed	rpm	4690	5170	5010	4710
5	Nominal torque (max. continuous torque)	mNm	112	91.1	90.9	102
6	Nominal current (max. continuous current)	A	3.68	2.52	1.63	1.27
7	Stall torque[1]	mNm	1190	918	895	1040
8	Stall current	A	40	26	16	13
9	Max. efficiency	%	84.4	82	81.9	83.4
	Characteristics					
10	Terminal resistance phase to phase	Ω	0.447	0.942	2.240	3.610
11	Terminal inductance phase to phase	mH	0.243	0.363	0.868	1.730
12	Torque constant	mNm/A	29.5	36	55.7	78.6
13	Speed constant	rpm/V	324	265	171	121
14	Speed/torque gradient	rpm/mNm	4.910	6.920	6.890	5.580
15	Mechanical time constant	ms	6.940	9.790	9.750	7.890
16	Rotor inertia	gcm²	135	135	135	135

Specifications

Thermal data

17	Thermal resistance housing-ambient	1.57 K/W
18	Thermal resistance winding-housing	8.28 K/W
19	Thermal time constant winding	28.8 s
20	Thermal time constant motor	78.3 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+125°C

Mechanical data (preloaded ball bearings)

23	Max. speed	10 000 rpm
24	Axial play at axial load < 8.0 N	0 mm
	> 8.0 N	0.14 mm
25	Radial play	preloaded
26	Max. axial load (dynamic)	7.2 N
27	Max. force for press fits (static)	53 N
	(static, shaft supported)	1000 N
28	Max. radial load, 5 mm from flange	14.5 N

Other specifications

29	Number of pole pairs	8
30	Number of phases	3
31	Weight of motor	116.4 g

Values listed in the table are nominal.

Connection V1		**V2** (sensors, AWG 24)
Pin 1	Hall sensor 1*	Hall sensor 1*
Pin 2	Hall sensor 2*	Hall sensor 2*
Pin 3	V_{Hall} 3.5...24 VDC	Hall sensor 3*
Pin 4	Motor winding 3	GND
Pin 5	Hall sensor 3*	V_{Hall} 3.5...24 VDC
Pin 6	GND	N.C.
Pin 7	Motor winding 1	
Pin 8	Motor winding 2	
		V2 (motor, AWG 22)
Pin 1		Motor winding 1
Pin 2		Motor winding 2
Pin 3		Motor winding 3
Pin 4		N.C.

*Internal pull-up (7..13 kΩ) on V_{Hall}

Wiring diagram for Hall sensors see p. 49

Connector	**Part number**	**Part number**
Molex	39-28-1083	43025-0600
Molex		39-01-2040

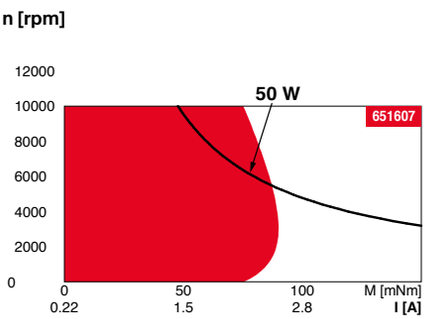
Connection cable for V1

Universal, L = 500 mm	**339380**
to EPOS, L = 500 mm	**354045**

21 **V2** Ambient temperature -20...+100°C

[1]Calculation does not include saturation effect (p. 61/168)

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

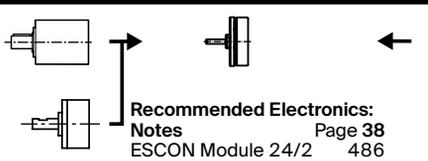
Assigned power rating

maxon Modular System

Details on catalog page 38

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 398

Spur Gearhead
∅45 mm
0.5 - 2.0 Nm
Page 400



Encoder MILE
256 - 2048 CPT,
2 channels
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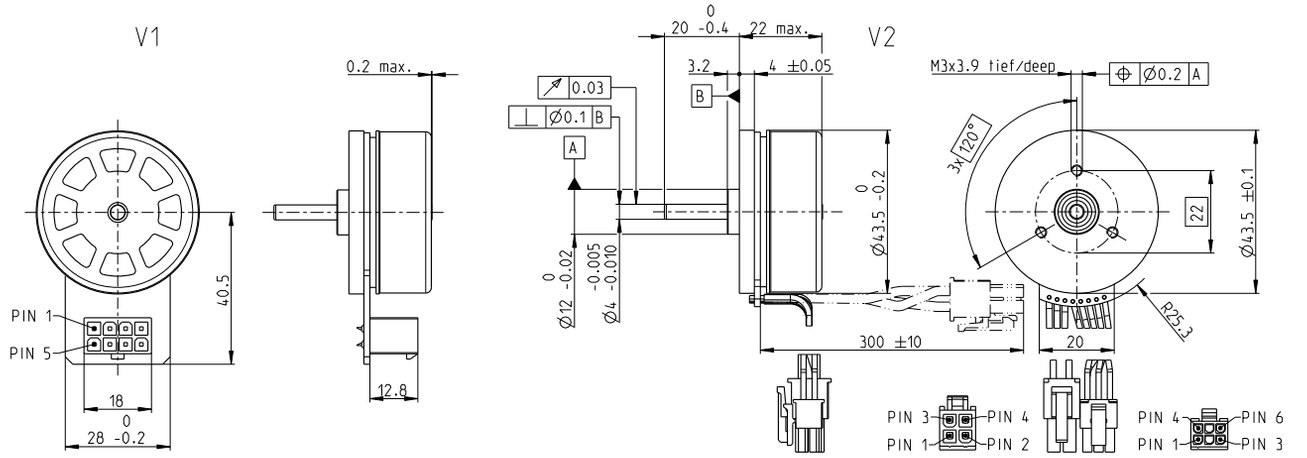
Recommended Electronics:

Notes	Page **38**
ESCON Module 24/2	486
ESCON 36/3 EC	487
ESCON Module 50/5	487
ESCON 50/5	489
DEC Module 24/2	491
DEC Module 50/5	491
EPOS4 Micro 24/5	495
EPOS4 Mod./Comp. 24/1.5	496
EPOS4 Mod./Comp. 50/5	496
EPOS4 Comp. 24/5 3-axes	497
EPOS4 50/5	501
EPOS2 P 24/5	504

EC 45 flat ∅43.5 mm, brushless, 60 Watt

NEW

Open Motor



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

V1 with Hall sensors	591476	**591477**	591478	**591479**
V2 with Hall sensors and cables	608131	608132	608133	608134

Motor Data						
	Values at nominal voltage					
1	Nominal voltage	V	18	24	36	48
2	No load speed	rpm	5740	6250	6060	5740
3	No load current	mA	277	238	151	104
4	Nominal speed	rpm	4510	4970	4810	4530
5	Nominal torque (max. continuous torque)	mNm	134	110	109	122
6	Nominal current (max. continuous current)	A	4.29	2.97	1.91	1.48
7	Stall torque[1]	mNm	1190	918	895	1040
8	Stall current	A	40	26	16	13
9	Max. efficiency	%	84.4	82	81.9	83.4
	Characteristics					
10	Terminal resistance phase to phase	Ω	0.447	0.942	2.240	3.610
11	Terminal inductance phase to phase	mH	0.243	0.363	0.868	1.730
12	Torque constant	mNm/A	29.5	36	55.7	78.6
13	Speed constant	rpm/V	324	265	171	121
14	Speed/torque gradient	rpm/mNm	4.910	6.920	6.890	5.580
15	Mechanical time constant	ms	6.940	9.790	9.750	7.890
16	Rotor inertia	gcm²	135	135	135	135

Specifications

Thermal data

17	Thermal resistance housing-ambient	0.268 K/W
18	Thermal resistance winding-housing	7.05 K/W
19	Thermal time constant winding	26.7 s
20	Thermal time constant motor	13.4 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+125°C

Mechanical data (preloaded ball bearings)

23	Max. speed	10 000 rpm
24	Axial play at axial load < 8.0 N	0 mm
	> 8.0 N	0.14 mm
25	Radial play	preloaded
26	Max. axial load (dynamic)	7.2 N
27	Max. force for press fits (static)	53 N
	(static, shaft supported)	1000 N
28	Max. radial load, 5 mm from flange	14.5 N

Other specifications

29	Number of pole pairs	8
30	Number of phases	3
31	Weight of motor	113.1 g

Values listed in the table are nominal.

Connection V1		**V2** (sensors, AWG 24)
Pin 1	Hall sensor 1*	Hall sensor 1*
Pin 2	Hall sensor 2*	Hall sensor 2*
Pin 3	V_{Hall} 3.5...24 VDC	Hall sensor 3*
Pin 4	Motor winding 3	GND
Pin 5	Hall sensor 3*	V_{Hall} 3.5...24 VDC
Pin 6	GND	N.C.
Pin 7	Motor winding 1	
Pin 8	Motor winding 2	
		V2 (motor, AWG 22)
Pin 1		Motor winding 1
Pin 2		Motor winding 2
Pin 3		Motor winding 3
Pin 4		N.C.

*Internal pull-up (7...13 kΩ) on V_{Hall}

Wiring diagram for Hall sensors see p. 49

Connector	**Part number**	**Part number**
Molex	39-28-1083	43025-0600
Molex		39-01-2040

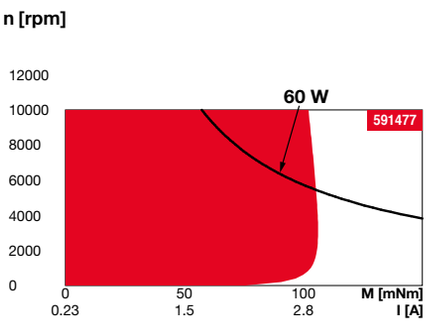
Connection cable for V1

Universal, L = 500 mm	**339380**
to EPOS, L = 500 mm	**354045**

21 **V2** Ambient temperature -20...+100°C

[1]Calculation does not include saturation effect (p. 61/168)

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 38

Planetary Gearhead
∅42 mm
3 - 15 Nm
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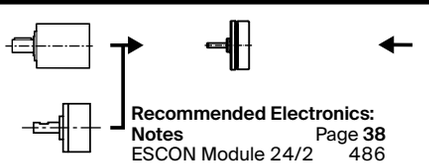
Spur Gearhead
∅45 mm
0.5 - 2.0 Nm
Page 400



Encoder MILE
256 - 2048 CPT,
2 channels
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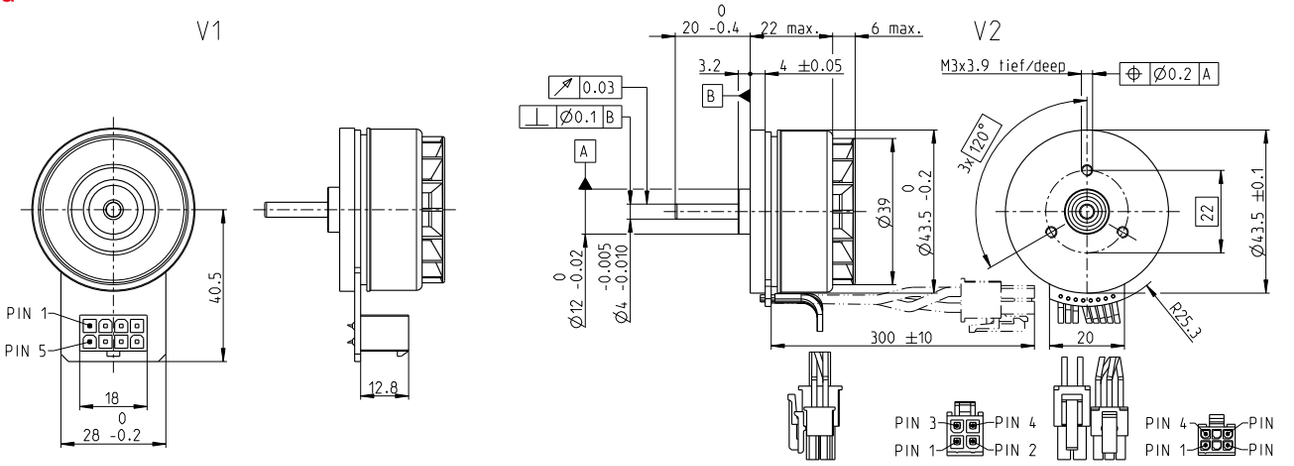
Recommended Electronics:

Notes	**Page 38**
ESCON Module 24/2	486
ESCON 36/3 EC	487
ESCON Module 50/5	487
ESCON 50/5	489
DEC Module 24/2	491
DEC Module 50/5	491
EPOS4 Micro 24/5	495
EPOS4 Mod./Comp. 50/5	496
EPOS4 Comp. 24/5 3-axes	497
EPOS4 50/5	501
EPOS2 P 24/5	504

EC 45 flat ∅43.5 mm, brushless, 90 Watt

NEW

Ventilated



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

V1 with Hall sensors	608135	**608136**	608137	**608138**
V2 with Hall sensors and cables	608139	608140	608141	608142

Motor Data					
	Values at nominal voltage				
1	Nominal voltage	V	18	24	36	48
2	No load speed	rpm	5740	6250	6060	5740
3	No load current	mA	281	242	154	105
4	Nominal speed	rpm	4280	4700	4560	4300
5	Nominal torque (max. continuous torque)	mNm	164	136	135	149
6	Nominal current (max. continuous current)	A	5.08	3.57	2.29	1.76
7	Stall torque[1]	mNm	1190	918	895	1040
8	Stall current	A	40	26	16	13
9	Max. efficiency	%	84.3	81.9	81.8	83.3
	Characteristics					
10	Terminal resistance phase to phase	Ω	0.447	0.942	2.240	3.610
11	Terminal inductance phase to phase	mH	0.243	0.363	0.868	1.730
12	Torque constant	mNm/A	29.5	36	55.7	78.6
13	Speed constant	rpm/V	324	265	171	121
14	Speed/torque gradient	rpm/mNm	4.910	6.920	6.890	5.580
15	Mechanical time constant	ms	6.940	9.790	9.750	7.890
16	Rotor inertia	gcm²	135	135	135	135

Specifications

Thermal data

17	Thermal resistance housing-ambient	0.23 K/W
18	Thermal resistance winding-housing	4.6 K/W
19	Thermal time constant winding	16 s
20	Thermal time constant motor	11.5 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+125°C

Mechanical data (preloaded ball bearings)

23	Max. speed	10 000 rpm
24	Axial play at axial load < 8.0 N	0 mm
	> 8.0 N	0.14 mm
25	Radial play	preloaded
26	Max. axial load (dynamic)	7.2 N
27	Max. force for press fits (static)	53 N
	(static, shaft supported)	1000 N
28	Max. radial load, 5 mm from flange	14.5 N

Other specifications

29	Number of pole pairs	8
30	Number of phases	3
31	Weight of motor	115.1 g

Values listed in the table are nominal.

Connection V1		**V2** (sensors, AWG 24)
Pin 1	Hall sensor 1*	Hall sensor 1*
Pin 2	Hall sensor 2*	Hall sensor 2*
Pin 3	V_{Hall} 3.5...24 VDC	Hall sensor 3*
Pin 4	Motor winding 3	GND
Pin 5	Hall sensor 3*	V_{Hall} 3.5...24 VDC
Pin 6	GND	N.C.
Pin 7	Motor winding 1	
Pin 8	Motor winding 2	

	V2 (motor, AWG 22)
Pin 1	Motor winding 1
Pin 2	Motor winding 2
Pin 3	Motor winding 3
Pin 4	N.C.

*Internal pull-up (7..13 kΩ) on V_{Hall}

Wiring diagram for Hall sensors see p. 49

Connector	**Part number**	**Part number**
Molex	39-28-1083	43025-0600
Molex		39-01-2040

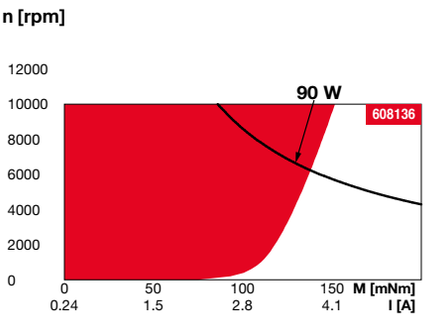
Connection cable for V1

Universal, L = 500 mm	**339380**
to EPOS, L = 500 mm	**354045**

21 **V2** Ambient temperature -20...+100°C

[1]Calculation does not include saturation effect (p. 61/168)

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

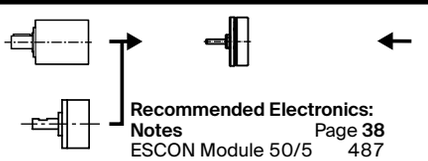
Assigned power rating

maxon Modular System

Details on catalog page 38

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 398

Spur Gearhead
∅45 mm
0.5 - 2.0 Nm
Page 400



Encoder MILE
256 - 2048 CPT,
2 channels
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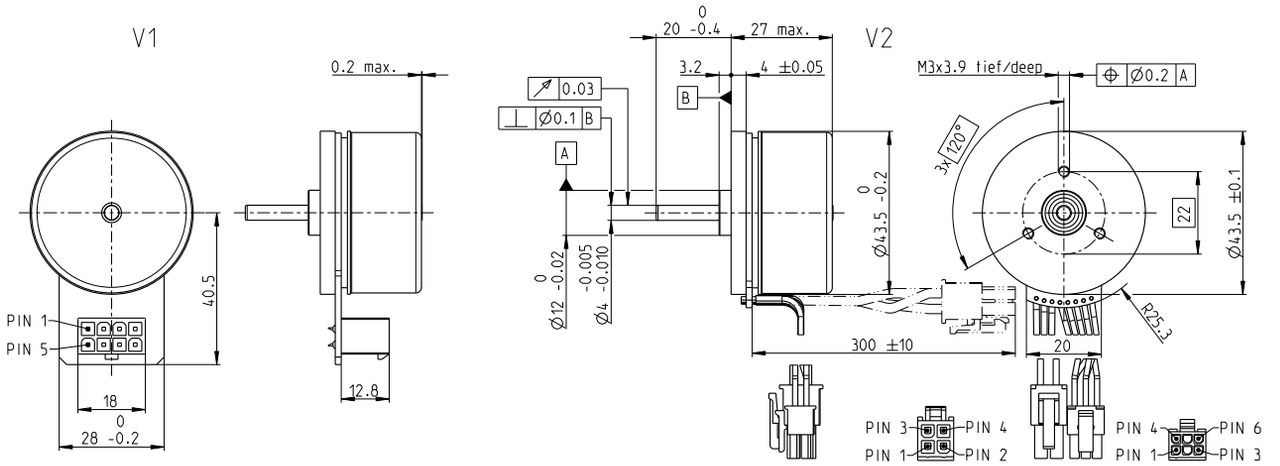
Recommended Electronics:

Notes	Page **38**
ESCON Module 50/5	487
ESCON Module 50/8 (HE)	488
ESCON 50/5	489
DEC Module 50/5	491
EPOS4 Mod./Comp. 50/5	496
EPOS4 Mod./Comp. 50/8	497
EPOS4 Mod./Comp. 50/15	497
EPOS4 50/5	501
EPOS2 P 24/5	504

EC 45 flat ∅43.5 mm, brushless, 70 Watt

NEW



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers				
V1 with Hall sensors	**651614**	651615	651616	**651617**
V2 with Hall sensors and cables	651618	651619	651620	651621

Motor Data (provisional)									
	Values at nominal voltage								
1	Nominal voltage	V	24	36	48	60			
2	No load speed	rpm	5600	5930	5580	3720			
3	No load current	mA	270	198	135	57			
4	Nominal speed	rpm	4750	5080	4750	3010			
5	Nominal torque (max. continuous torque)	mNm	134	110	112	143			
6	Nominal current (max. continuous current)	A	3.29	1.97	1.41	0.92			
7	Stall torque[1]	mNm	1690	1320	1260	1240			
8	Stall current	A	42	23	16	8			
9	Max. efficiency	%	84.9	82.7	82.6	84.2			
	Characteristics								
10	Terminal resistance phase to phase	Ω	0.573	1.560	3.070	7.370			
11	Terminal inductance phase to phase	mH	0.301	0.601	1.210	4.270			
12	Torque constant	mNm / A	40.4	57	80.8	152			
13	Speed constant	rpm / V	236	167	118	62.8			
14	Speed / torque gradient	rpm / mNm	3.350	4.580	4.490	3.040			
15	Mechanical time constant	ms	6.350	8.680	8.510	5.770			
16	Rotor inertia	gcm²	181	181	181	181			

Specifications

Thermal data

17	Thermal resistance housing-ambient	2.55 K/W
18	Thermal resistance winding-housing	6.64 K/W
19	Thermal time constant winding	43.1 s
20	Thermal time constant motor	127 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+125°C

Mechanical data (preloaded ball bearings)

23	Max. speed	10 000 rpm
24	Axial play at axial load < 8.0 N	0 mm
	> 8.0 N	0.14 mm
25	Radial play	preloaded
26	Max. axial load (dynamic)	7.2 N
27	Max. force for press fits (static)	53 N
	(static, shaft supported)	1000 N
28	Max. radial load, 5 mm from flange	15.1 N

Other specifications

29	Number of pole pairs	8
30	Number of phases	3
31	Weight of motor	150.4 g

Values listed in the table are nominal.

Connection V1		**V2** (sensors, AWG 24)
Pin 1	Hall sensor 1*	Hall sensor 1*
Pin 2	Hall sensor 2*	Hall sensor 2*
Pin 3	V_{Hall} 3.5...24 VDC	Hall sensor 3*
Pin 4	Motor winding 3	GND
Pin 5	Hall sensor 3*	V_{Hall} 3.5...24 VDC
Pin 6	GND	N.C.
Pin 7	Motor winding 1	
Pin 8	Motor winding 2	

	V2 (motor, AWG 22)
Pin 1	Motor winding 1
Pin 2	Motor winding 2
Pin 3	Motor winding 3
Pin 4	N.C.

*Internal pull-up (7 ... 13 kΩ) on V_{Hall}

Wiring diagram for Hall sensors see p. 49

Connector	**Part number**	**Part number**
Molex	39-28-1083	43025-0600
Molex		39-01-2040

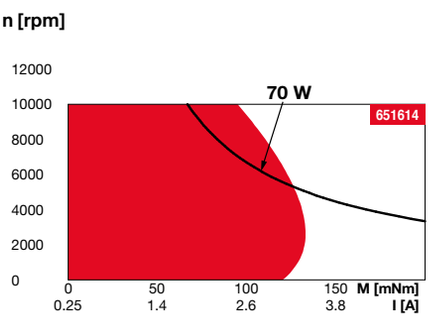
Connection cable for V1

Universal, L = 500 mm	**339380**
to EPOS, L = 500 mm	**354045**

21	**V2** Ambient temperature	-20 ... +100°C

[1]Calculation does not include saturation effect (p. 61/168)

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 38

Planetary Gearhead
∅42 mm
3 - 15 Nm
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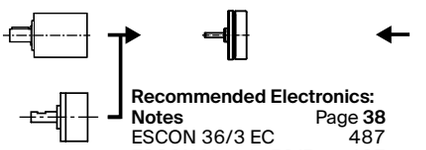
Spur Gearhead
∅45 mm
0.5 - 2.0 Nm
Page 400



Encoder MILE
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2 channels
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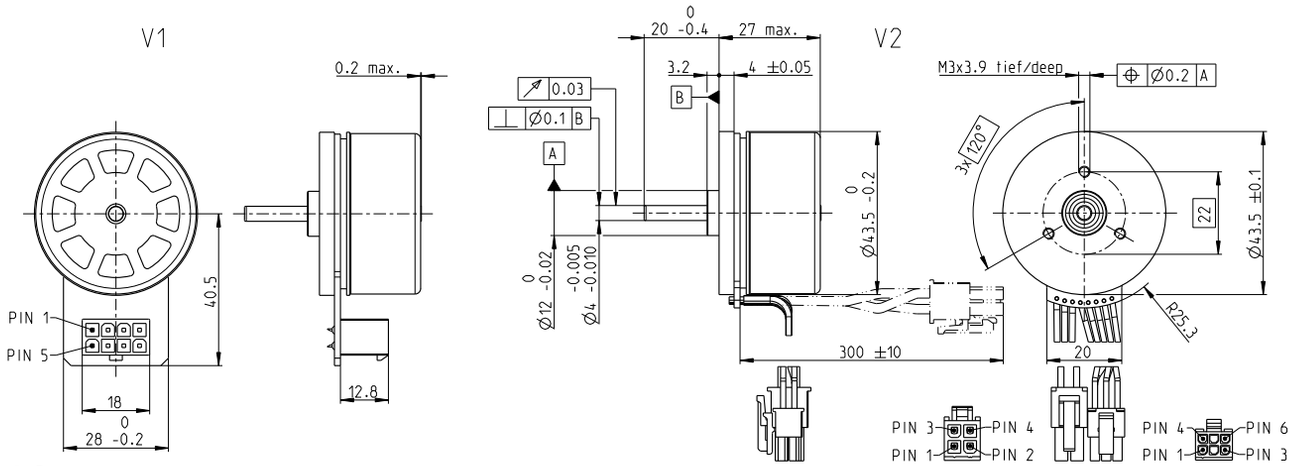
Recommended Electronics:

Notes	**Page 38**
ESCON 36/3 EC	487
ESCON Module 50/5	487
ESCON 50/5	489
ESCON 70/10	489
DEC Module 50/5	491
EPOS4 Micro 24/5	495
EPOS4 Mod./Comp. 50/5	496
EPOS4 50/5	501
EPOS2 P 24/5	504

EC 45 flat ∅43.5 mm, brushless, 80 Watt

NEW

Open Motor



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

V1 with Hall sensors	**591480**	591481	591482	**591483**
V2 with Hall sensors and cables	608144	608145	608146	608147

Motor Data						
	Values at nominal voltage					
1	Nominal voltage	V	24	36	48	60
2	No load speed	rpm	5600	5930	5580	3720
3	No load current	mA	270	198	135	57
4	Nominal speed	rpm	4560	4870	4560	2890
5	Nominal torque (max. continuous torque)	mNm	167	139	140	170
6	Nominal current (max. continuous current)	A	3.96	2.41	1.71	1.06
7	Stall torque[1]	mNm	1690	1320	1260	1240
8	Stall current	A	42	23	16	8
9	Max. efficiency	%	84.9	82.7	82.6	84.2
	Characteristics					
10	Terminal resistance phase to phase	Ω	0.573	1.560	3.070	7.370
11	Terminal inductance phase to phase	mH	0.301	0.601	1.210	4.270
12	Torque constant	mNm/A	40.4	57	80.8	152
13	Speed constant	rpm/V	236	167	118	62.8
14	Speed/torque gradient	rpm/mNm	3.350	4.580	4.490	3.040
15	Mechanical time constant	ms	6.350	8.680	8.510	5.770
16	Rotor inertia	gcm²	181	181	181	181

Specifications

Thermal data

17	Thermal resistance housing-ambient	1.29 K/W
18	Thermal resistance winding-housing	5.23 K/W
19	Thermal time constant winding	34 s
20	Thermal time constant motor	64.7 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+125°C

Mechanical data (preloaded ball bearings)

23	Max. speed	10 000 rpm
24	Axial play at axial load < 8.0 N	0 mm
	> 8.0 N	0.14 mm
25	Radial play	preloaded
26	Max. axial load (dynamic)	7.2 N
27	Max. force for press fits (static)	53 N
	(static, shaft supported)	1000 N
28	Max. radial load, 5 mm from flange	15.1 N

Other specifications

29	Number of pole pairs	8
30	Number of phases	3
31	Weight of motor	147.1 g

Values listed in the table are nominal.

Connection V1		**V2** (sensors, AWG 24)
Pin 1	Hall sensor 1*	Hall sensor 1*
Pin 2	Hall sensor 2*	Hall sensor 2*
Pin 3	V_{Hall} 3.5...24 VDC	Hall sensor 3*
Pin 4	Motor winding 3	GND
Pin 5	Hall sensor 3*	V_{Hall} 3.5...24 VDC
Pin 6	GND	N.C.
Pin 7	Motor winding 1	
Pin 8	Motor winding 2	

	V2 (motor, AWG 22)
Pin 1	Motor winding 1
Pin 2	Motor winding 2
Pin 3	Motor winding 3
Pin 4	N.C.

*Internal pull-up (7..13 kΩ) on V_{Hall}

Wiring diagram for Hall sensors see p. 49

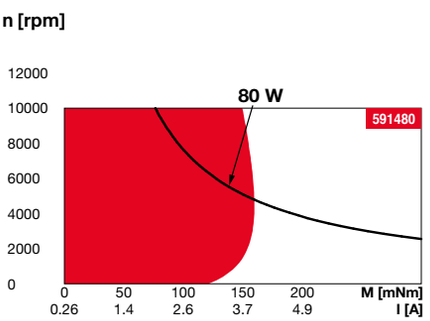
Connector	**Part number**	**Part number**
Molex	39-28-1083	43025-0600
Molex		39-01-2040

Connection cable for V1	
Universal, L = 500 mm	**339380**
to EPOS, L = 500 mm	**354045**

21	**V2** Ambient temperature	-20...+100°C

[1]Calculation does not include saturation effect (p. 61/168)

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

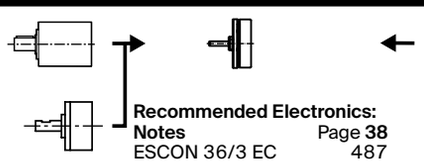
Assigned power rating

maxon Modular System

Details on catalog page 38

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 398

Spur Gearhead
∅45 mm
0.5 - 2.0 Nm
Page 400



Encoder MILE
256 - 2048 CPT,
2 channels
Page 446

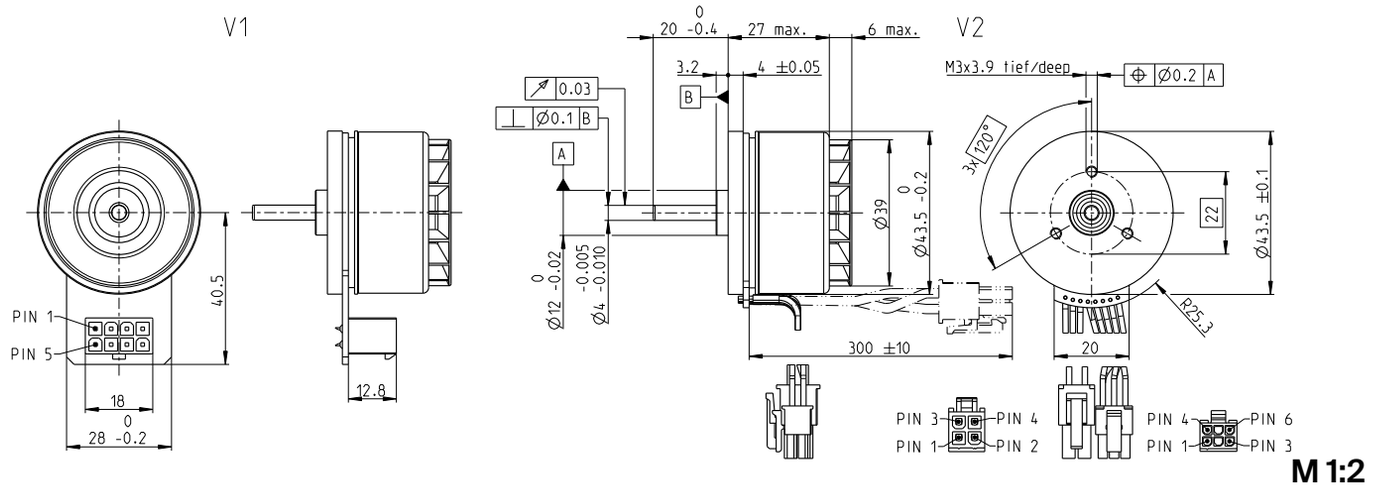
Recommended Electronics:

Notes	Page **38**
ESCON 36/3 EC	487
ESCON Module 50/5	487
ESCON 50/5	489
ESCON 70/10	489
DEC Module 50/5	491
EPOS4 Micro 24/5	495
EPOS4 Mod./Comp. 50/5	496
EPOS4 50/5	501
EPOS2 P 24/5	504

EC 45 flat ∅43.5 mm, brushless, 120 Watt

NEW

Ventilated



M 1:2

Stock program
Standard program
Special program (on request)

	Part Numbers			
V1 with Hall sensors	**608148**	608149	608150	**608151**
V2 with Hall sensors and cables	608152	608153	608154	608155

Motor Data (provisional)						
	Values at nominal voltage					
1	Nominal voltage	V	24	36	48	60
2	No load speed	rpm	5600	5930	5580	3720
3	No load current	mA	277	204	138	58.2
4	Nominal speed	rpm	4520	4820	4510	2900
5	Nominal torque (max. continuous torque)	mNm	174	147	146	169
6	Nominal current (max. continuous current)	A	4.13	2.53	1.78	1.06
7	Stall torque[1]	mNm	1690	1320	1260	1240
8	Stall current	A	42	23	16	8
9	Max. efficiency	%	84.7	82.5	82.4	84.1
	Characteristics					
10	Terminal resistance phase to phase	Ω	0.573	1.560	3.070	7.370
11	Terminal inductance phase to phase	mH	0.301	0.601	1.210	4.270
12	Torque constant	mNm / A	40.4	57	80.8	152
13	Speed constant	rpm / V	236	167	118	62.8
14	Speed / torque gradient	rpm / mNm	3.350	4.580	4.490	3.040
15	Mechanical time constant	ms	6.350	8.680	8.510	5.770
16	Rotor inertia	gcm²	181	181	181	181

Specifications

Thermal data

17	Thermal resistance housing-ambient	1.94 K/W
18	Thermal resistance winding-housing	3.86 K/W
19	Thermal time constant winding	25.1 s
20	Thermal time constant motor	97 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+125°C

Mechanical data (preloaded ball bearings)

23	Max. speed	10 000 rpm
24	Axial play at axial load < 8.0 N	0 mm
	> 8.0 N	0.14 mm
25	Radial play	preloaded
26	Max. axial load (dynamic)	7.2 N
27	Max. force for press fits (static)	53 N
	(static, shaft supported)	1000 N
28	Max. radial load, 5 mm from flange	15.1 N

Other specifications

29	Number of pole pairs	8
30	Number of phases	3
31	Weight of motor	149.1 g

Values listed in the table are nominal.

Connection V1		**V2** (sensors, AWG 24)
Pin 1	Hall sensor 1*	Hall sensor 1*
Pin 2	Hall sensor 2*	Hall sensor 2*
Pin 3	V_{Hall} 3.5...24 VDC	Hall sensor 3*
Pin 4	Motor winding 3	GND
Pin 5	Hall sensor 3*	V_{Hall} 3.5...24 VDC
Pin 6	GND	N.C.
Pin 7	Motor winding 1	
Pin 8	Motor winding 2	

	V2 (motor, AWG 22)
Pin 1	Motor winding 1
Pin 2	Motor winding 2
Pin 3	Motor winding 3
Pin 4	N.C.

*Internal pull-up (7 ... 13 kΩ) on V_{Hall}

Wiring diagram for Hall sensors see p. 49

Connector	**Part number**	**Part number**
Molex	39-28-1083	43025-0600
Molex		39-01-2040

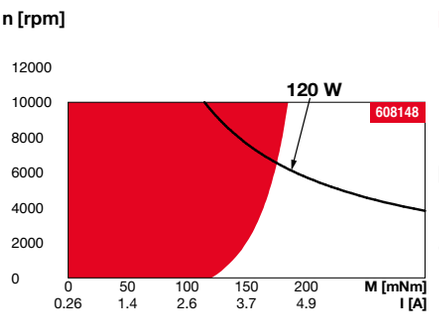
Connection cable for V1

Universal, L = 500 mm	**339380**
to EPOS, L = 500 mm	**354045**

21 **V2** Ambient temperature -20 ... +100°C

[1]Calculation does not include saturation effect (p. 61/168)

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

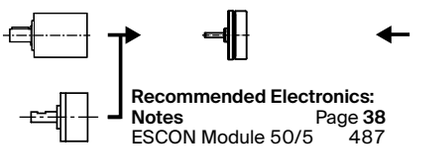
Assigned power rating

maxon Modular System

Details on catalog page 38

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 398

Spur Gearhead
∅45 mm
0.5 - 2.0 Nm
Page 400



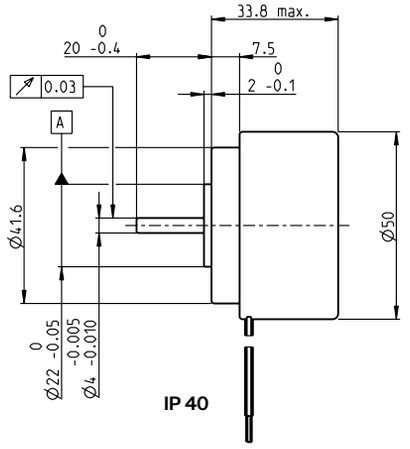
Encoder MILE
256 - 2048 CPT,
2 channels
Page 446

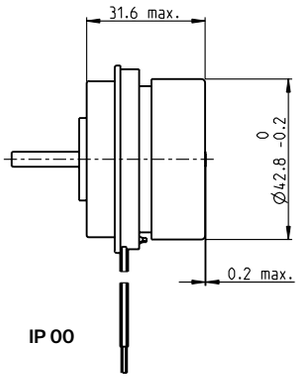
Recommended Electronics:

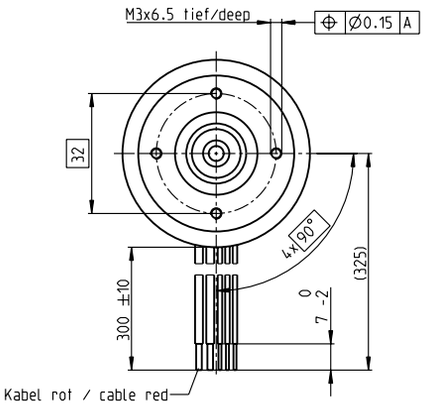
Notes	**Page 38**
ESCON Module 50/5	487
ESCON Module 50/8 (HE)	488
ESCON 50/5	489
ESCON 70/10	489
DEC Module 50/5	491
EPOS4 Mod./Comp. 50/5	496
EPOS4 Mod./Comp. 50/8	497
EPOS4 50/5	501
EPOS2 P 24/5	504

EC 45 flat brushless, 30 Watt, with integrated electronics

1-Q-Speed Controller







M 1:2

Stock program
Standard program
Special program (on request)

	Part Numbers			
	5 wire version			
	Enable		Direction	
IP 40 (with cover)	688721		688722	
IP 00 (without cover)		688725		688726
Motor Data (provisional)				
Values at nominal voltage				
1 Nominal voltage V	24	24	24	24
2 No load speed rpm	6000	6000	6000	6000
3 No load current mA	210	210	210	210
4 Nominal speed rpm	6000	6000	6000	6000
5 Nominal torque (max. continuous torque) mNm	59.4	89.6	59.4	89.6
6 Nominal current (max. continuous current) A	2.06	3.1	2.06	3.1
33 Max. torque mNm	104	104	104	104
34 Max. current A	3.62	3.62	3.62	3.62
9 Max. efficiency %	76	76	76	76
Characteristics				
35 Type of control	Speed	Speed	Speed	Speed
36 Supply voltage $+V_{CC}$ V	10...28	10...28	10...28	10...28
37 Speed set value input V	0.33...10.8	0.33...10.8	0.33...10.8	0.33...10.8
38 Scale speed set value input rpm/V	600	600	600	600
39 Speed range rpm	200...6480	200...6480	200...6480	200...6480
40 Max. acceleration rpm/s	6000	6000	6000	6000

Specifications

Thermal data

17	Thermal resistance housing-ambient	5.6 (3.12) K/W
18	Thermal resistance winding-housing	7.7 (4.5) K/W
19	Thermal time constant winding	37.6 (22) s
20	Thermal time constant motor	633 (353) s
21	Ambient temperature	-40...+85°C
22	Max. winding temperature	+125°C
41	Max. temperature of electronics	+105°C

Mechanical data (preloaded ball bearings)

16	Rotor inertia		135 gcm^2
24	Axial play at axial load	< 7.0 N	0 mm
		> 7.0 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		6.8 N
27	Max. force for press fits (static)		95 N
	(static, shaft supported)		1000 N
28	Max. radial load, 5 mm from flange		55 N

Other specifications

31	Weight of motor	226 g
32	Direction of rotation	Clockwise (CW)

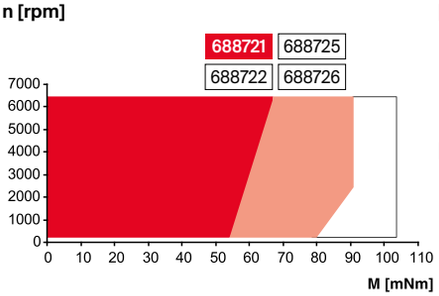
Values listed in the table are nominal.

Protective functions
Overload protection, blockage protection, inverse-polarity protection, thermal overload protection, low/high voltage cut-off

Connection 5 wire version (Cable AWG 18/24)

red	$+V_{CC}$ 10...28 VDC
black	GND
white	Speed set value input
green	Monitor n (6 pulses per revolution)
grey	Disable (Type Enable) or sense of direction (Type Direction)

Operating Range



Comments

Continuous operation
The drive can be operated with a speed controller and, taking account of the given thermal resistance (fig. 17 and 18) at an ambient temperature of 25°C, does not exceed the maximum permissible operating temperatures.

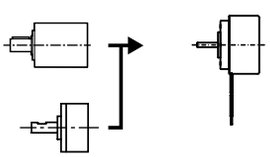
Overload range
The drive reaches these operating points. Speed may vary from the set value. The overload protection shuts down the drive in the event of sustained overload.

maxon Modular System

Details on catalog page 38

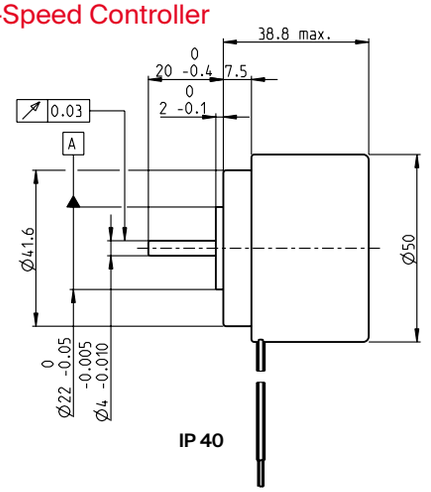
Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 398

Spur Gearhead
∅45 mm
0.5 - 2.0 Nm
Page 400

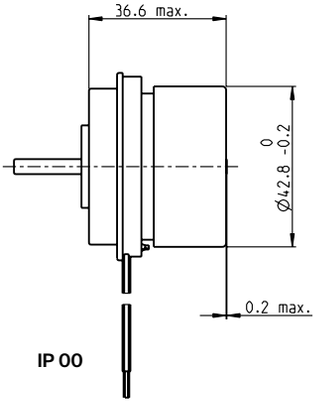


EC 45 flat brushless, 50 Watt, with integrated electronics

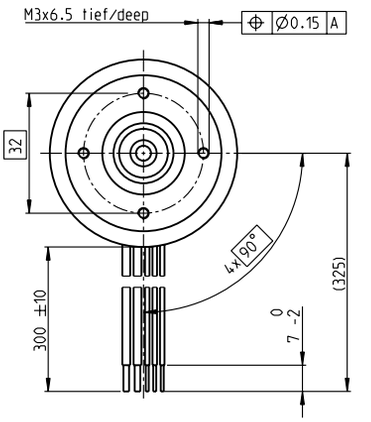
1-Q-Speed Controller



IP 40



IP 00



M 1:2

Stock program
Standard program
Special program (on request)

	Part Numbers			
	5 wire version			
	Enable		Direction	
IP 40 (with cover)	688723		688724	
IP 00 (without cover)		688727		688728

Motor Data (provisional)									
	Values at nominal voltage								
1	Nominal voltage	V	24	24	24	24			
2	No load speed	rpm	4500	4500	4500	4500			
3	No load current	mA	192	192	192	192			
4	Nominal speed	rpm	4500	4500	4500	4500			
5	Nominal torque (max. continuous torque)	mNm	82.8	131	82.8	131			
6	Nominal current (max. continuous current)	A	2.15	3.45	2.15	3.45			
33	Max. torque	mNm	149	149	149	149			
34	Max. current	A	3.86	3.86	3.86	3.86			
9	Max. efficiency	%	76	76	76	76			
	Characteristics								
35	Type of control		Speed	Speed	Speed	Speed			
36	Supply voltage +V_{CC}	V	10...28	10...28	10...28	10...28			
37	Speed set value input	V	0.33...10.8	0.33...10.8	0.33...10.8	0.33...10.8			
38	Scale speed set value input	rpm/V	600	600	600	600			
39	Speed range	rpm	200...6480	200...6480	200...6480	200...6480			
40	Max. acceleration	rpm/s	6000	6000	6000	6000			

Specifications

	Thermal data	
17	Thermal resistance housing-ambient	5.1 (2.5) K/W
18	Thermal resistance winding-housing	6.7 (3.3) K/W
19	Thermal time constant winding	45.1 (22.1) s
20	Thermal time constant motor	256 (124) s
21	Ambient temperature	-40...+85°C
22	Max. winding temperature	+125°C
41	Max. temperature of electronics	+105°C

	Mechanical data (preloaded ball bearings)		
16	Rotor inertia		181 gcm²
24	Axial play at axial load	< 7.0 N	0 mm
		> 7.0 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		6.8 N
27	Max. force for press fits (static)		95 N
	(static, shaft supported)		1000 N
28	Max. radial load, 5 mm from flange		63 N

	Other specifications	
31	Weight of motor	260 g
32	Direction of rotation	Clockwise (CW)

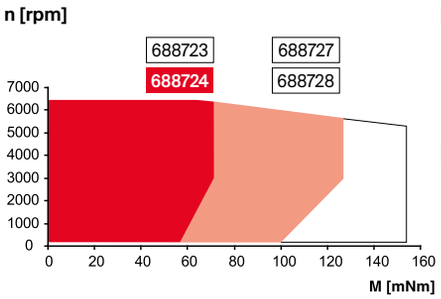
Values listed in the table are nominal.

Protective functions
Overload protection, blockage protection, inverse-polarity protection, thermal overload protection, low/high voltage cut-off

Connection 5 wire version (Cable AWG 18/24)

red	+V_{CC} 10...28 VDC
black	GND
white	Speed set value input
green	Monitor n (6 pulses per revolution)
grey	Disable (Type Enable) or sense of direction (Type Direction)

Operating Range



Comments

Continuous operation
The drive can be operated with a speed controller and, taking account of the given thermal resistance (fig. 17 and 18) at an ambient temperature of 25°C, does not exceed the maximum permissible operating temperatures.

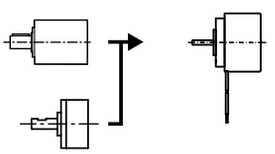
Overload range
The drive reaches these operating points. Speed may vary from the set value. The overload protection shuts down the drive in the event of sustained overload.

maxon Modular System

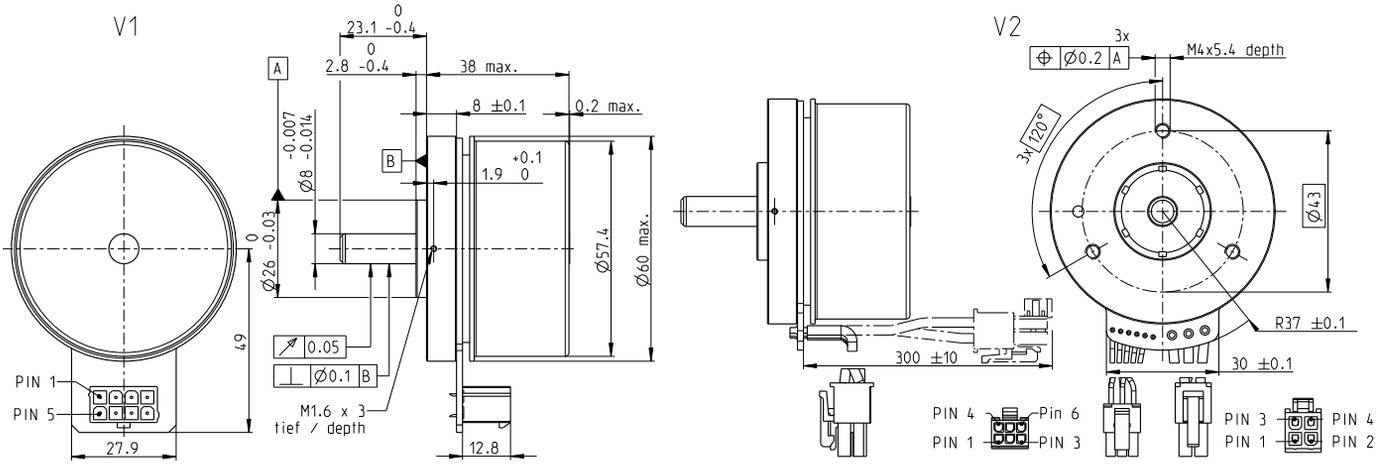
Details on catalog page 38

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 398

Spur Gearhead
∅45 mm
0.5 - 2.0 Nm
Page 400



EC 60 flat ∅60 mm, brushless, 100 Watt



Stock program
Standard program
Special program (on request)

Part Numbers			
V1 with Hall sensors	625854	**625855**	625856
V2 with Hall sensors and cables	647691	645604	647692

Motor Data					
	Values at nominal voltage				
1	Nominal voltage	V	12	24	48
2	No load speed	rpm	3760	4300	4020
3	No load current	mA	797	493	221
4	Nominal speed	rpm	3210	3730	3460
5	Nominal torque (max. continuous torque)	mNm	261	269	298
6	Nominal current (max. continuous current)	A	8.72	5.14	2.61
7	Stall torque[1]	mNm	3340	4300	4870
8	Stall current	A	111	81.9	43.2
9	Max. efficiency	%	84.1	85.3	86.4
	Characteristics				
10	Terminal resistance phase to phase	Ω	0.108	0.293	1.11
11	Terminal inductance phase to phase	mH	0.0911	0.279	1.28
12	Torque constant	mNm/A	30	52.5	113
13	Speed constant	rpm/V	318	182	84.8
14	Speed/torque gradient	rpm/mNm	1.14	1.01	0.837
15	Mechanical time constant	ms	9.99	8.86	7.32
16	Rotor inertia	gcm²	835	835	835

Specifications

Thermal data

17	Thermal resistance housing-ambient	2.5 K/W
18	Thermal resistance winding-housing	3.8 K/W
19	Thermal time constant winding	41.4 s
20	Thermal time constant motor	90 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+125°C

Mechanical data (preloaded ball bearings)

23	Max. speed	6000 rpm
24	Axial play at axial load < 12.0 N	0 mm
	> 12.0 N	0.14 mm
25	Radial play	preloaded
26	Max. axial load (dynamic)	12 N
27	Max. force for press fits (static)	170 N
	(static, shaft supported)	8000 N
28	Max. radial load, 5 mm from flange	112 N

Other specifications

29	Number of pole pairs	7
30	Number of phases	3
31	Weight of motor	355 g

Values listed in the table are nominal.

Connection V1		**V2** (sensors, AWG 24)
Pin 1	Hall sensor1	Hall sensor1
Pin 2	Hall sensor 2	Hall sensor 2
Pin 3	V_{Hall} 4.5...24 VDC	Hall sensor 3
Pin 4	Motor winding 3	GND
Pin 5	Hall sensor 3	V_{Hall} 4.5...24 VDC
Pin 6	GND	N.C.
Pin 7	Motor winding 1	
Pin 8	Motor winding 2	
		V2 (Motor, AWG 16)
Pin 1		Motor winding 1
Pin 2		Motor winding 2
Pin 3		Motor winding 3
Pin 4		N.C.

Wiring diagram for Hall sensors see p. 49

Connector	**Part number**	
Molex	46015-0806	43025-0600
Molex		39-01-2040

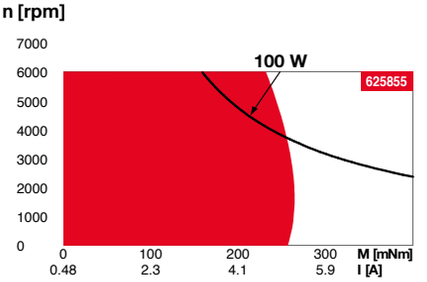
Connection cable for V1

Universal, L = 500 mm	**339380**
zu EPOS4, L = 500 mm	**354045**

[1]Calculation does not include saturation effect (p. 61/168)

Operating Range

n [rpm]



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

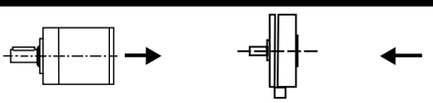
Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 38

Planetary Gearhead
∅52 mm
4 - 30 Nm
Page 402



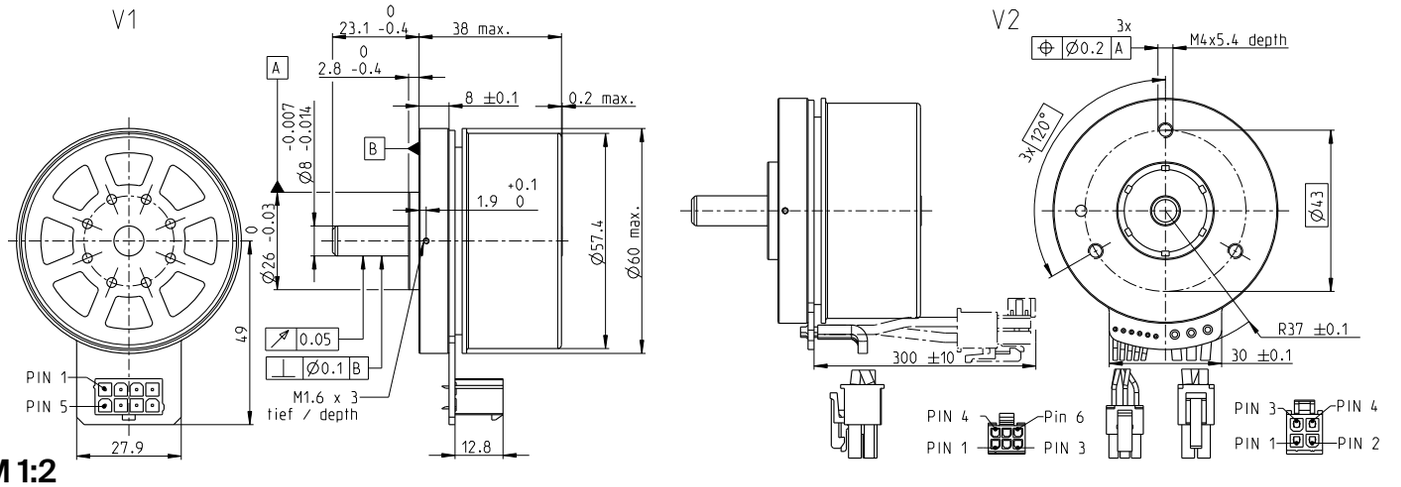
Encoder MILE
512 - 4096 CPT,
2 channels
Page 447

Recommended Electronics:

Notes	Page **38**
ESCON Module 50/5	487
ESCON Mod. 50/8 (HE)	488
ESCON 50/5	489
ESCON 70/10	489
DEC Module 50/5	491
EPOS4 Mod./Comp. 50/5	496
EPOS4 Mod./Comp. 50/8	497
EPOS4 Mod./Comp. 50/15	500
EPOS4 50/5	501
EPOS4 70/15	501
EPOS2 P 24/5	504

EC 60 flat ∅60 mm, brushless, 150 Watt

Open Rotor



Stock program
Standard program
Special program (on request)

Part Numbers			
V1 with Hall sensors	625857	625858	625859
V2 with Hall sensors and cables	647693	647694	647695

Motor Data					
	Values at nominal voltage				
1	Nominal voltage	V	12	24	48
2	No load speed	rpm	3760	4300	4020
3	No load current	mA	815	497	224
4	Nominal speed	rpm	2990	3480	3230
5	Nominal torque (max. continuous torque)	mNm	378	401	437
6	Nominal current (max. continuous current)	A	12*	7.25	3.63
7	Stall torque[1]	mNm	3340	4300	4870
8	Stall current	A	111	81.9	43.2
9	Max. efficiency	%	83.8	85.2	86.3
	Characteristics				
10	Terminal resistance phase to phase	Ω	0.108	0.293	1.11
11	Terminal inductance phase to phase	mH	0.0911	0.279	1.28
12	Torque constant	mNm/A	30	52.5	113
13	Speed constant	rpm/V	318	182	84.8
14	Speed/torque gradient	rpm/mNm	1.14	1.01	0.837
15	Mechanical time constant	ms	9.68	8.6	9.1
16	Rotor inertia	gcm²	810	810	810

Specifications

Thermal data

17	Thermal resistance housing-ambient	1.94 K/W
18	Thermal resistance winding-housing	1.48 K/W
19	Thermal time constant winding	16.1 s
20	Thermal time constant motor	69.9 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+125°C

Mechanical data (preloaded ball bearings)

23	Max. speed		6000 rpm
24	Axial play at axial load	< 12.0 N	0 mm
		> 12.0 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		12 N
27	Max. force for press fits (static)		170 N
	(static, shaft supported)		8000 N
28	Max. radial load, 5 mm from flange		112 N

Other specifications

29	Number of pole pairs	7
30	Number of phases	3
31	Weight of motor	350 g

Values listed in the table are nominal.

Connection V1	**V2** (sensors, AWG 24)
Pin 1 Hall sensor1	Hall sensor1
Pin 2 Hall sensor 2	Hall sensor 2
Pin 3 V_{Hall} 4.5...24 VDC	Hall sensor 3
Pin 4 Motor winding 3	GND
Pin 5 Hall sensor 3	V_{Hall} 4.5...24 VDC
Pin 6 GND	N.C.
Pin 7 Motor winding 1	
Pin 8 Motor winding 2	

	V2 (Motor, AWG 16)
Pin 1	Motor winding 1
Pin 2	Motor winding 2
Pin 3	Motor winding 3
Pin 4	N.C.

Wiring diagram for Hall sensors see p. 49

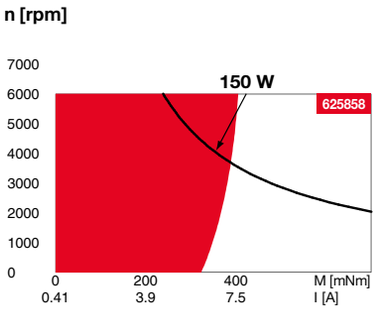
Connector	**Part number**	
Molex	46015-0806	43025-0600
Molex		39-01-2040

Connection cable for V1

Universal, L = 500 mm	**339380**
to EPOS4, L = 500 mm	**354045**

[1]Calculation does not include saturation effect (p. 61/168)

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 38

Planetary Gearhead
∅52 mm
4 - 30 Nm
Page 402

Encoder MILE
512 - 4096 CPT,
2 channels
Page 447

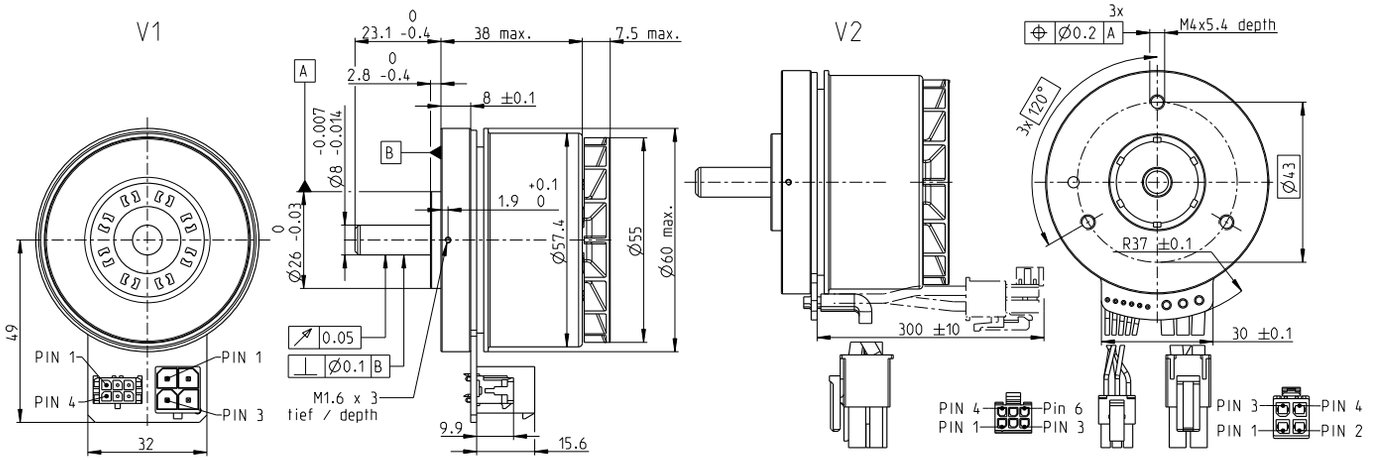
Recommended Electronics:

Notes	Page **38**
ESCON Module 50/5	487
ESCON Mod. 50/8 (HE)	488
ESCON 50/5	489
ESCON 70/10	489
DEC Module 50/5	491
EPOS4 Mod./Comp. 50/5	496
EPOS4 Mod./Comp. 50/8	497
EPOS4 Mod./Comp. 50/15	500
EPOS4 50/5	501
EPOS4 70/15	501
EPOS2 P 24/5	504

*In combination with EPOS4 positioning controllers, the connector technology limits the nominal current (max. continuous current load) is limited to 11 A.

EC 60 flat ∅60 mm, brushless, 200 Watt

Ventilated



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

V1 with Hall sensors	625860	**614949**	625861
V2 with Hall sensors and cables	647696	642221	647697

Motor Data									
Values at nominal voltage									
1 Nominal voltage	V	12	24	48					
2 No load speed	rpm	3760	4300	4020					
3 No load current	mA	815	497	224					
4 Nominal speed	rpm	2790	3240	3020					
5 Nominal torque (max. continuous torque)	mNm	492	536	577					
6 Nominal current (max. continuous current)	A	15.1*	9.28	4.6					
7 Stall torque[1]	mNm	3340	4300	4870					
8 Stall current	A	111	81.9	43.2					
9 Max. efficiency	%	83.8	85.2	86.3					
Characteristics									
10 Terminal resistance phase to phase	Ω	0.108	0.293	1.11					
11 Terminal inductance phase to phase	mH	0.0911	0.279	1.28					
12 Torque constant	mNm/A	30	52.5	113					
13 Speed constant	rpm/V	318	182	84.8					
14 Speed/torque gradient	rpm/mNm	1.14	1.01	0.837					
15 Mechanical time constant	ms	9.95	8.83	9.29					
16 Rotor inertia	gcm²	832	832	832					

Specifications

Thermal data

17	Thermal resistance housing-ambient	1.22 K/W
18	Thermal resistance winding-housing	0.843 K/W
19	Thermal time constant winding	9.19 s
20	Thermal time constant motor	44 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+125°C

Mechanical data (preloaded ball bearings)

23	Max. speed		6000 rpm
24	Axial play at axial load	< 12.0 N	0 mm
		> 12.0 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		12 N
27	Max. force for press fits (static)		170 N
	(static, shaft supported)		8000 N
28	Max. radial load, 5 mm from flange		112 N

Other specifications

29	Number of pole pairs	7
30	Number of phases	3
31	Weight of motor	360 g

Values listed in the table are nominal.

Connection V1		**V2** (sensors, AWG 24)
Pin 1	Hall sensor 1	Hall sensor 1
Pin 2	Hall sensor 2	Hall sensor 2
Pin 3	Hall sensor 3	Hall sensor 3
Pin 4	GND	
Pin 5	V_{Hall} 4.5...24 VDC	GND V_{Hall} 4.5...24 VDC
Pin 6	N.C.	N.C.
		V2 (Motor, AWG 14)
Pin 1	Motor winding 1	Motor winding 1
Pin 2	Motor winding 2	Motor winding 2
Pin 3	Motor winding 3	Motor winding 3
Pin 4		N.C.

Wiring diagram for Hall sensors see p. 49

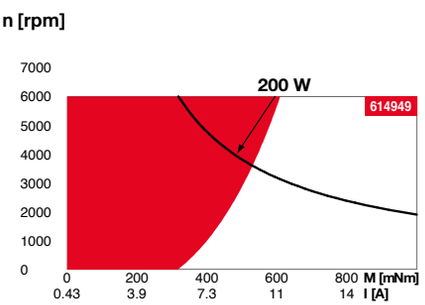
Connector	**Part number**	
Molex Micro-Fit	43045-0627	43025-0600
Molex	76829-0104	171692-0104

Connection cable for V1

for windings, L = 3 m	**520851**
for Hall sensors, L = 3 m	**275878**

[1]Calculation does not include saturation effect (p. 61/168)

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

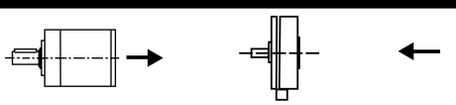
Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 38

Planetary Gearhead
∅52 mm
4 - 30 Nm
Page 402



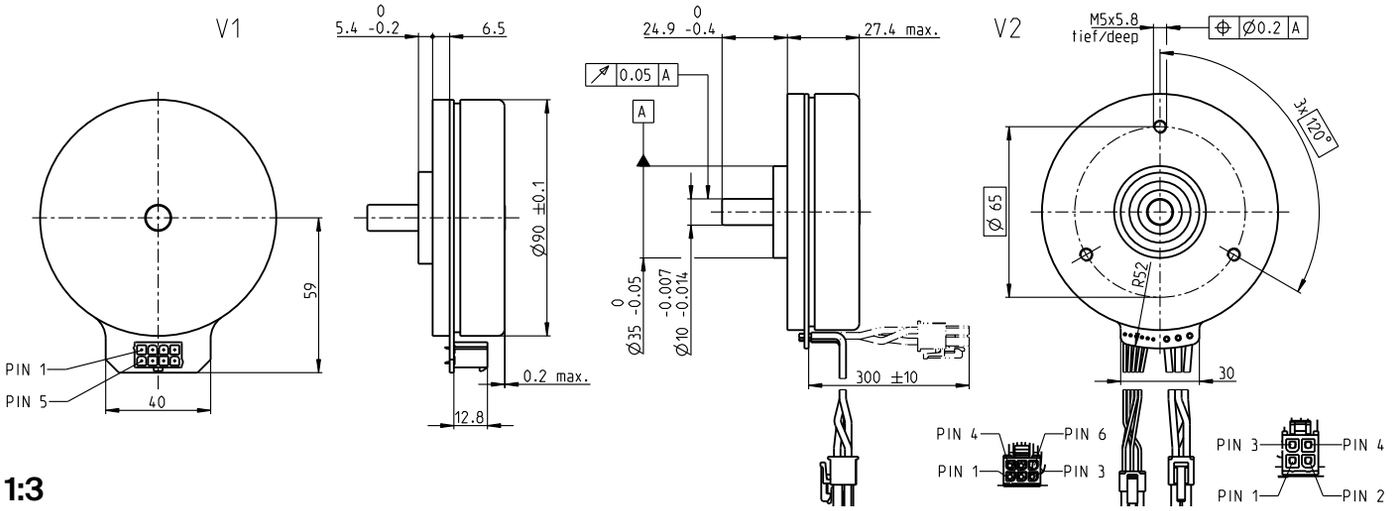
Encoder MILE
512 - 4096 CPT,
2 channels
Page 447

Recommended Electronics:

Notes	Page **38**
ESCON Module 50/5	487
ESCON Mod. 50/8 (HE)	488
ESCON 70/10	489
DEC Module 50/5	491

*625860 and 647696 cannot be combined with the MILE encoder, because the current limit of the connectors of the MILE circuit board is 13 A.

EC 90 flat ∅90 mm, brushless, 160 Watt



M 1:3

Stock program
Standard program
Special program (on request)

	Part Numbers			
V1 with Hall sensors	586655	**515458**	505592	**580047**
V2 with Hall sensors and cables	607321	607322	607323	607324

Motor Data						
	Values at nominal voltage					
1	Nominal voltage	V	12	24	36	60
2	No load speed	rpm	3170	3170	3070	2600
3	No load current	mA	1320	658	420	197
4	Nominal speed	rpm	2710	2720	2640	2200
5	Nominal torque (max. continuous torque)	mNm	458	457	453	460
6	Nominal current (max. continuous current)	A	12.8*	6.39	4.09	2.1
7	Stall torque[1]	mNm	7400	7910	7580	6410
8	Stall current	A	208	111	68.9	29.6
9	Max. efficiency	%	85	85	85	85
	Characteristics					
10	Terminal resistance phase to phase	Ω	0.0577	0.216	0.523	2.03
11	Terminal inductance phase to phase	mH	0.058	0.232	0.554	2.15
12	Torque constant	mNm/A	35.6	71.2	110	217
13	Speed constant	rpm/V	268	134	86.8	44.1
14	Speed/torque gradient	rpm/mNm	0.435	0.407	0.412	0.412
15	Mechanical time constant	ms	14.4	13.5	13.7	13.7
16	Rotor inertia	gcm²	3170	3170	3170	3170

Specifications

Thermal data

17	Thermal resistance housing-ambient	1.75 K/W
18	Thermal resistance winding-housing	3.71 K/W
19	Thermal time constant winding	69.8 s
20	Thermal time constant motor	260 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+125°C

Mechanical data (preloaded ball bearings)

23	Max. speed	5000 rpm
24	Axial play at axial load	0.14 mm
25	Radial play	preloaded
26	Max. axial load (dynamic)	34 N
27	Max. force for press fits (static)	440 N
	(static, shaft supported)	8000 N
28	Max. radial load, 10 mm from flange	100 N

Other specifications

29	Number of pole pairs	11
30	Number of phases	3
31	Weight of motor	630 g

Values listed in the table are nominal.

Connection V1		**V2** (sensors, AWG 24)
Pin 1	Hall sensor 1	Hall sensor 1
Pin 2	Hall sensor 2	Hall sensor 2
Pin 3	V_{Hall} 4.5...24 VDC	Hall sensor 3
Pin 4	Motor winding 3	GND
Pin 5	Hall sensor 3	V_{Hall} 4.5...24 VDC
Pin 6	GND	N.C.
Pin 7	Motor winding 1	
Pin 8	Motor winding 2	

	V2 (motor, AWG 16)
Pin 1	Motor winding 1
Pin 2	Motor winding 2
Pin 3	Motor winding 3
Pin 4	N.C.

Wiring diagram for Hall sensors see p. 49

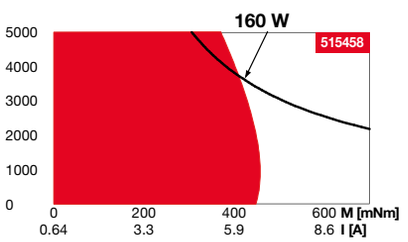
Connector	**Part number**
Molex 46015-0806	43025-0600
Molex	39-01-2040

Connection cable for V1

Universal, L = 500 mm	**339380**
to EPOS4, L = 500 mm	**354045**

[1]Calculation does not include saturation effect (p. 61/168)

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

*In combination with EPOS4 positioning controllers, the connector technology limits the nominal current (max. continuous current load) is limited to 11 A.

maxon Modular System

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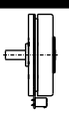

Encoder MILE
512 - 6400 CPT,
2 channels
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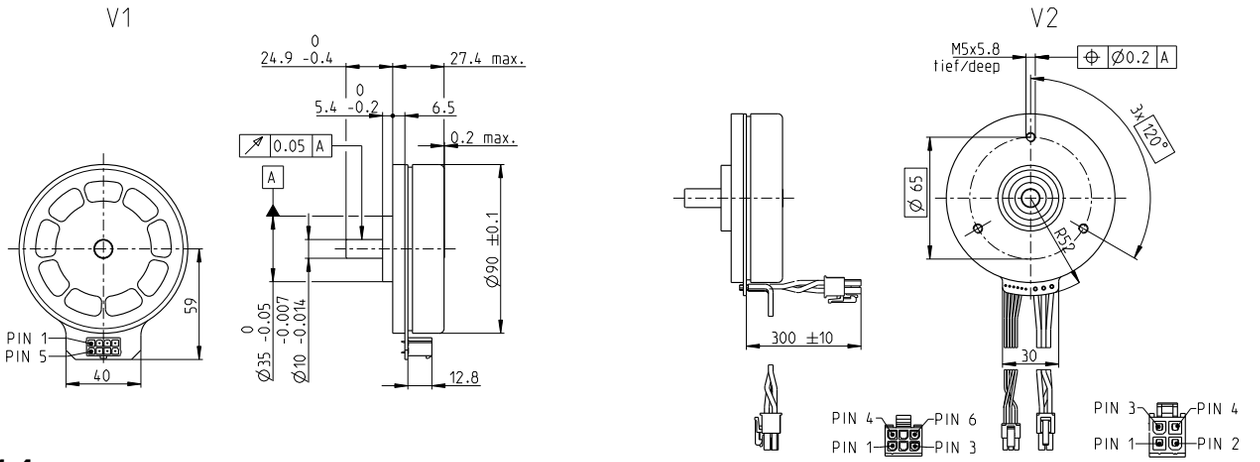
Recommended Electronics:

Notes	**Page 38**
ESCON Mod. 50/4 EC-S	487
ESCON Mod. 50/5	487
ESCON Mod. 50/8 (HE)	488
ESCON 50/5	489
ESCON 70/10	489
DEC Module 50/5	491
EPOS4 Mod./Comp. 50/5	496
EPOS4 Mod./Comp. 50/8	497
EPOS4 Mod./Comp. 50/15	500
EPOS4 50/5	501
EPOS4 70/15	501

EC 90 flat ∅90 mm, brushless, 220 Watt

Open Rotor



M 1:4

Stock program
Standard program
Special program (on request)

Part Numbers			
V1 with Hall sensors	**607942**	607943	607944
V2 with Hall sensors and cables	607946	607947	607948

Motor Data									
Values at nominal voltage									
1	Nominal voltage	V	24	36	60				
2	No load speed	rpm	3170	3070	2600				
3	No load current	mA	658	420	197				
4	Nominal speed	rpm	2490	2420	2020				
5	Nominal torque (max. continuous torque)	mNm	729	715	692				
6	Nominal current (max. continuous current)	A	9.44	6.01	2.96				
7	Stall torque[1]	mNm	7910	7580	6410				
8	Stall current	A	111	68.9	29.6				
9	Max. efficiency	%	85.4	85.2	84.6				
Characteristics									
10	Terminal resistance phase to phase	Ω	0.216	0.523	2.03				
11	Terminal inductance phase to phase	mH	0.232	0.554	2.15				
12	Torque constant	mNm/A	71.2	110	217				
13	Speed constant	rpm/V	134	86.8	44.1				
14	Speed/torque gradient	rpm/mNm	0.407	0.412	0.412				
15	Mechanical time constant	ms	13.5	13.7	13.7				
16	Rotor inertia	gcm²	2875	2875	2875				

Specifications

Thermal data

17	Thermal resistance housing-ambient	1.87 K/W
18	Thermal resistance winding-housing	1.43 K/W
19	Thermal time constant winding	27.7 s
20	Thermal time constant motor	278 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+125°C

Mechanical data (preloaded ball bearings)

23	Max. speed	5000 rpm
24	Axial play at axial load	0.14 mm
25	Radial play	preloaded
26	Max. axial load (dynamic)	34 N
27	Max. force for press fits (static)	440 N
	(static, shaft supported)	8000 N
28	Max. radial load, 10 mm from flange	100 N

Other specifications

29	Number of pole pairs	11
30	Number of phases	3
31	Weight of motor	624 g

Values listed in the table are nominal.

Connection V1		**V2** (sensors, AWG 24)
Pin 1	Hall sensor 1	Hall sensor 1
Pin 2	Hall sensor 2	Hall sensor 2
Pin 3	V_{Hall} 4.5...24 VDC	Hall sensor 3
Pin 4	Motor winding 3	GND
Pin 5	Hall sensor 3	V_{Hall} 4.5...24 VDC
Pin 6	GND	N.C.
Pin 7	Motor winding 1	
Pin 8	Motor winding 2	
		V2 (motor, AWG 16)
Pin 1		Motor winding 1
Pin 2		Motor winding 2
Pin 3		Motor winding 3
Pin 4		N.C.

Wiring diagram for Hall sensors see p. 49

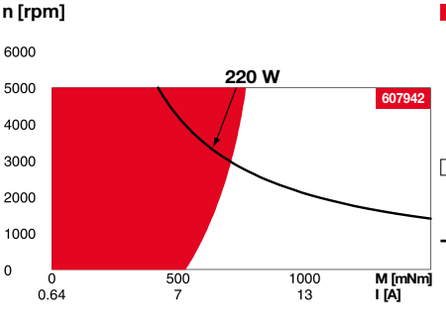
Connector		**Part number**
Molex	46015-0806	43025-0600
Molex		39-01-2040

Connection cable for V1

Universal, L = 500 mm	**339380**
to EPOS4, L = 500 mm	**354045**

[1]Calculation does not include saturation effect (p. 61/168)

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

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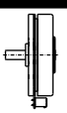

Encoder MILE
512 - 6400 CPT,
2 channels
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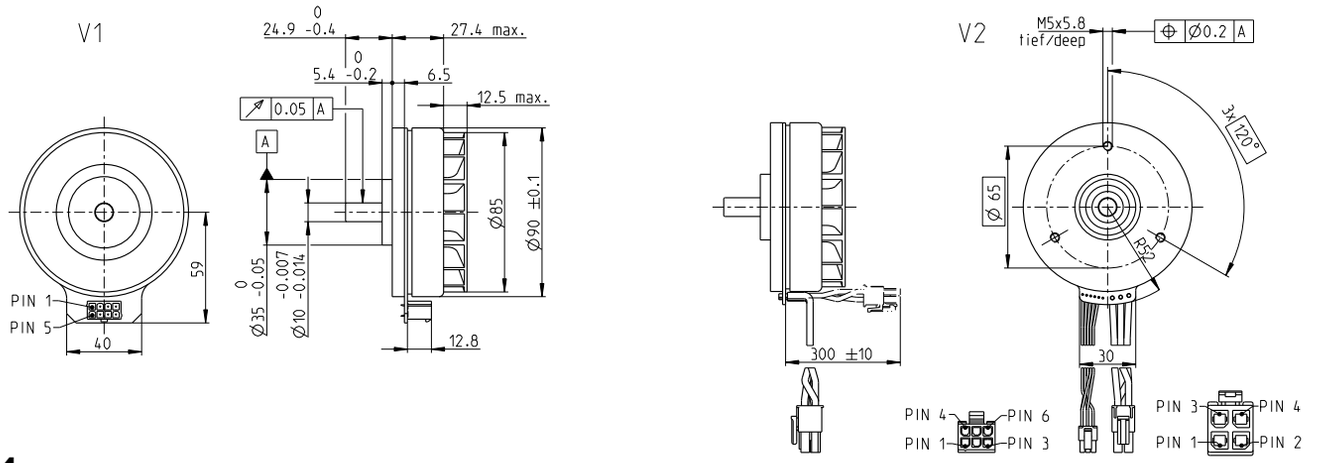
Recommended Electronics:

Notes	Page **38**
ESCON Mod. 50/5	487
ESCON Mod. 50/8 (HE)	488
ESCON 50/5	489
ESCON 70/10	489
DEC Module 50/5	491
EPOS4 Mod./Comp. 50/5	496
EPOS4 Mod./Comp. 50/8	497
EPOS4 Mod./Comp. 50/15	500
EPOS4 50/5	501
EPOS4 70/15	501

EC 90 flat ∅90 mm, brushless, 360 Watt

Ventilated



M 1:4

Stock program
Standard program
Special program (on request)

Part Numbers

V1 with Hall sensors		607950	607951	607952
V2 with Hall sensors and cables	607953	607954	607955	607956

Motor Data						
	Values at nominal voltage					
1	Nominal voltage	V	12	24	36	60
2	No load speed	rpm	3210	3210	3120	2640
3	No load current	mA	1390	696	444	210
4	Nominal speed	rpm	2310	2340	2270	1890
5	Nominal torque (max. continuous torque)	mNm	951	953	933	894
6	Nominal current (max. continuous current)	A	23.9*	12	7.61	3.73
7	Stall torque[1]	mNm	7290	7800	7470	6320
8	Stall current	A	208	111	68.9	29.6
9	Max. efficiency	%	84.5	85	84.8	84
	Characteristics					
10	Terminal resistance phase to phase	Ω	0.0577	0.216	0.523	2.03
11	Terminal inductance phase to phase	mH	0.058	0.232	0.554	2.15
12	Torque constant	mNm/A	35.1	70.1	108	214
13	Speed constant	rpm/V	272	136	88.1	44.7
14	Speed/torque gradient	rpm/mNm	0.448	0.419	0.425	0.424
15	Mechanical time constant	ms	14.9	13.9	14.1	14.1
16	Rotor inertia	gcm²	3210	3210	3210	3210

Specifications

Thermal data

17	Thermal resistance housing-ambient	1.12 K/W
18	Thermal resistance winding-housing	1.04 K/W
19	Thermal time constant winding	20 s
20	Thermal time constant motor	166 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+125°C

Mechanical data (preloaded ball bearings)

23	Max. speed	5000 rpm
24	Axial play at axial load	0.14 mm
25	Radial play	preloaded
26	Max. axial load (dynamic)	34 N
27	Max. force for press fits (static)	440 N
	(static, shaft supported)	8000 N
28	Max. radial load, 10 mm from flange	100 N

Other specifications

29	Number of pole pairs	11
30	Number of phases	3
31	Weight of motor	638 g

Values listed in the table are nominal.

Connection V1		**V2** (sensors, AWG 24)
Pin 1	Hall sensor 1	Hall sensor 1
Pin 2	Hall sensor 2	Hall sensor 2
Pin 3	V_{Hall} 4.5...24 VDC	Hall sensor 3
Pin 4	Motor winding 3	GND
Pin 5	Hall sensor 3	V_{Hall} 4.5...24 VDC
Pin 6	GND	N.C.
Pin 7	Motor winding 1	
Pin 8	Motor winding 2	
		V2 (motor, AWG 14)
Pin 1		Motor winding 1
Pin 2		Motor winding 2
Pin 3		Motor winding 3
Pin 4		N.C.

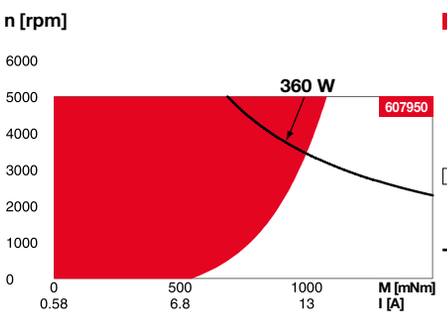
Wiring diagram for Hall sensors see p. 49

Connector		**Part number**
Molex	46015-0806	43025-0600
Molex		171692-0104

Connection cable for V1
Universal, L = 500 mm **339380**

[1]Calculation does not include saturation effect (p. 61/168)

Operating Range



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

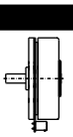
Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

*In combination with EPOS4 positioning controllers, the connector technology limits the nominal current (max. continuous current load) is limited to 11 A.

maxon Modular System

Details on catalog page 38



Encoder MILE
512 - 6400 CPT,
2 channels
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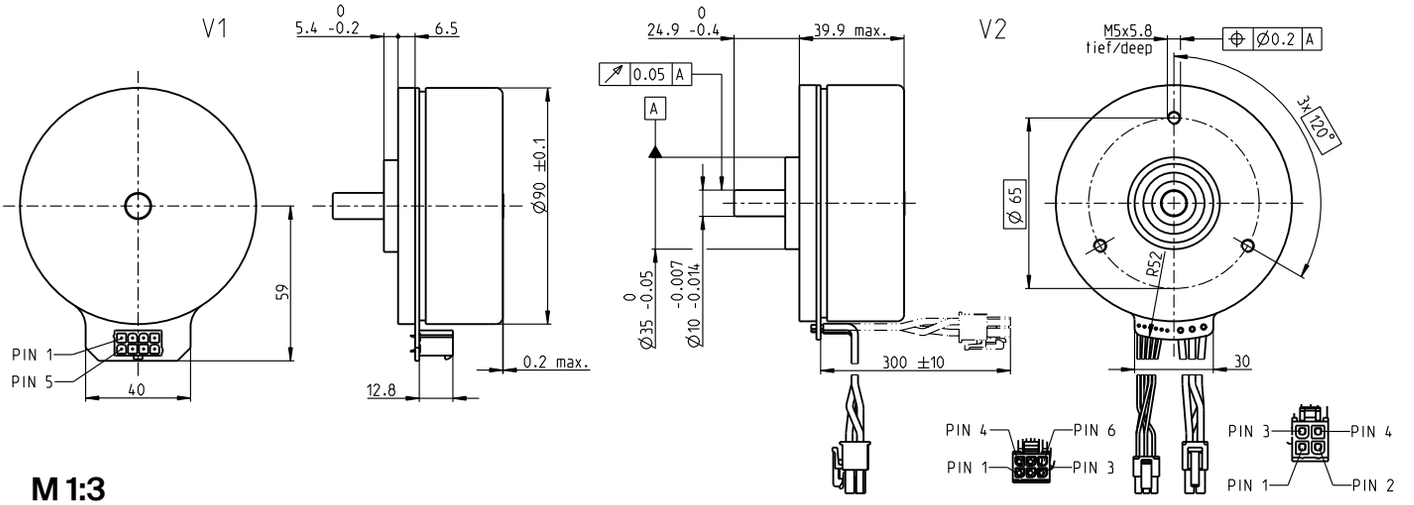
Recommended Electronics:

Notes	**Page 38**
ESCON Mod. 50/5	487
ESCON Mod. 50/8 (HE)	488
ESCON 50/5	489
ESCON 70/10	489
DEC Module 50/5	491

EC 90 flat ∅90 mm, brushless, 260 Watt



Stock program
Standard program
Special program (on request)

	Part Numbers			
V1 with Hall sensors	**500269**	500266	**500267**	500268
V2 with Hall sensors and cables	607325	607326	607327	607328

Motor Data						
Values at nominal voltage						
1 Nominal voltage	V	18	30	48	60	
2 No load speed	rpm	2110	2080	1960	1980	
3 No load current	mA	830	490	278	227	
4 Nominal speed	rpm	1790	1780	1670	1690	
5 Nominal torque (max. continuous torque)	mNm	1010	988	964	963	
6 Nominal current (max. continuous current)	A	12.1*	7.06	4.06	3.28	
7 Stall torque[1]	mNm	14800	14600	13100	13300	
8 Stall current	A	183	107	56.9	46.7	
9 Max. efficiency	%	87	87	86	87	
Characteristics						
10 Terminal resistance phase to phase	Ω	0.0983	0.28	0.844	1.28	
11 Terminal inductance phase to phase	mH	0.133	0.369	1.07	1.63	
12 Torque constant	mNm/A	80.7	136	231	286	
13 Speed constant	rpm/V	118	70.2	41.3	33.4	
14 Speed/torque gradient	rpm/mNm	0.144	0.144	0.151	0.15	
15 Mechanical time constant	ms	7.63	7.66	7.99	7.97	
16 Rotor inertia	gcm²	5060	5060	5060	5060	

Specifications

Thermal data

17	Thermal resistance housing-ambient	1.74 K/W
18	Thermal resistance winding-housing	1.82 K/W
19	Thermal time constant winding	57 s
20	Thermal time constant motor	258 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+125°C

Mechanical data (preloaded ball bearings)

23	Max. speed	5000 rpm
24	Axial play at axial load	0.14 mm
25	Radial play	preloaded
26	Max. axial load (dynamic)	34 N
27	Max. force for press fits (static)	440 N
	(static, shaft supported)	8000 N
28	Max. radial load, 10 mm from flange	130 N

Other specifications

29	Number of pole pairs	11
30	Number of phases	3
31	Weight of motor	980 g

Values listed in the table are nominal.

Connection V1		**V2** (sensors, AWG 24)
Pin 1	Hall sensor 1	Hall sensor 1
Pin 2	Hall sensor 2	Hall sensor 2
Pin 3	V_{Hall} 4.5...24 VDC	Hall sensor 3
Pin 4	Motor winding 3	GND
Pin 5	Hall sensor 3	V_{Hall} 4.5...24 VDC
Pin 6	GND	N.C.
Pin 7	Motor winding 1	
Pin 8	Motor winding 2	
		V2 (motor, AWG 16)
Pin 1		Motor winding 1
Pin 2		Motor winding 2
Pin 3		Motor winding 3
Pin 4		N.C.

Wiring diagram for Hall sensors see p. 49

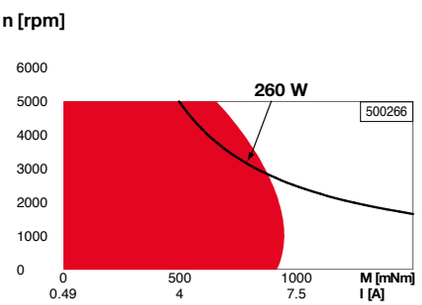
Connector		**Part number**
Molex	46015-0806	43025-0600
Molex		39-01-2040

Connection cable for V1

Universal, L = 500 mm	**339380**
to EPOS4, L = 500 mm	**354045**

[1]Calculation does not include saturation effect (p. 61/168)

Operating Range



*In combination with EPOS4 positioning controllers, the connector technology limits the nominal current (max. continuous current load) is limited to 11 A.

Comments

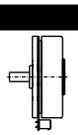
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 38



Encoder MILE
512 - 6400 CPT,
2 channels
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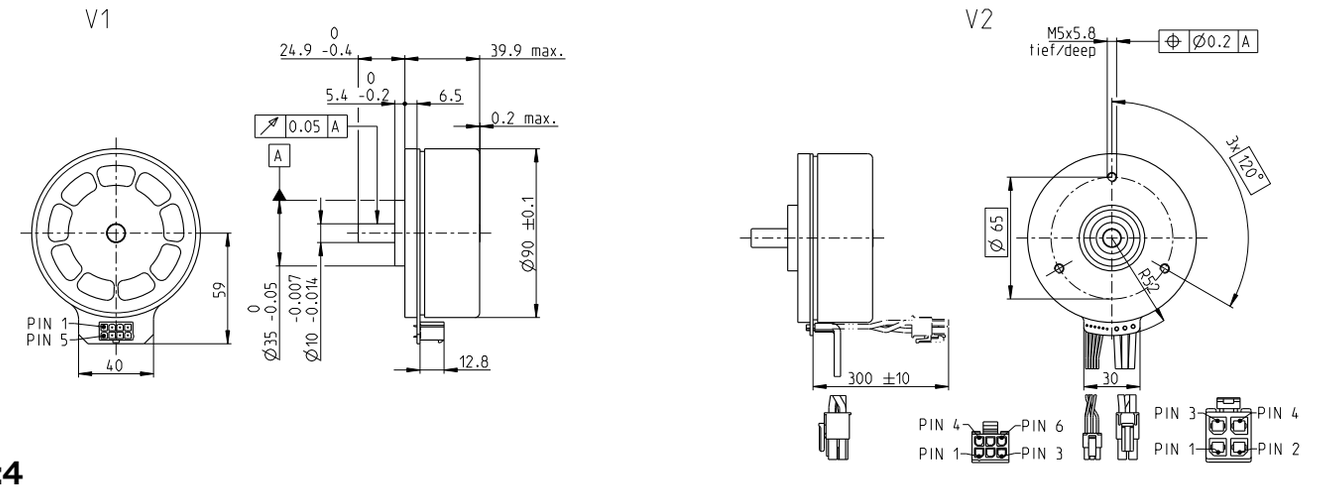
Recommended Electronics:

Notes	**Page 38**
ESCON Mod. 50/4 EC-S	487
ESCON Mod. 50/5	487
ESCON Mod. 50/8 (HE)	488
ESCON 50/5	489
ESCON 70/10	489
DEC Module 50/5	491
EPOS4 Mod./Comp. 50/5	496
EPOS4 Mod./Comp. 50/8	497
EPOS4 Mod./Comp. 50/15	500
EPOS4 50/5	501
EPOS4 70/15	501

EC 90 flat ∅90 mm, brushless, 400 Watt

Open Rotor



M 1:4

Stock program
Standard program
Special program (on request)

Part Numbers

V1 with Hall sensors		607930	607931	607932
V2 with Hall sensors and cables	607933	607934	607935	607936

Motor Data									
	Values at nominal voltage								
1	Nominal voltage	V	18	30	48	60			
2	No load speed	rpm	2080	2080	1960	1980			
3	No load current	mA	792	475	272	221			
4	Nominal speed	rpm	1700	1700	1600	1620			
5	Nominal torque (max. continuous torque)	mNm	1300	1260	1210	1220			
6	Nominal current (max. continuous current)	A	14.9*	8.73	4.96	4.03			
7	Stall torque[1]	mNm	14900	14600	13100	13300			
8	Stall current	A	183	107	56.9	46.7			
9	Max. efficiency	%	87.4	87.3	86.8	86.9			
	Characteristics								
10	Terminal resistance phase to phase	Ω	0.0983	0.28	0.844	1.28			
11	Terminal inductance phase to phase	mH	0.133	0.369	1.07	1.63			
12	Torque constant	mNm/A	81.6	136	231	286			
13	Speed constant	rpm/V	117	70.2	41.3	33.4			
14	Speed/torque gradient	rpm/mNm	0.141	0.144	0.151	0.15			
15	Mechanical time constant	ms	7.47	7.66	7.99	7.97			
16	Rotor inertia	gcm²	4765	4765	4765	4765			

Specifications

Thermal data

17	Thermal resistance housing-ambient	1.56 K/W
18	Thermal resistance winding-housing	1.09 K/W
19	Thermal time constant winding	34.2 s
20	Thermal time constant motor	232 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+125°C

Mechanical data (preloaded ball bearings)

23	Max. speed	5000 rpm
24	Axial play at axial load	0.14 mm
25	Radial play	preloaded
26	Max. axial load (dynamic)	34 N
27	Max. force for press fits (static) (static, shaft supported)	440 N 8000N
28	Max. radial load, 10 mm from flange	130 N

Other specifications

29	Number of pole pairs	11
30	Number of phases	3
31	Weight of motor	964 g

Values listed in the table are nominal.

Connection V1		**V2** (sensors, AWG 24)
Pin 1	Hall sensor 1	Hall sensor 1
Pin 2	Hall sensor 2	Hall sensor 2
Pin 3	V_{Hall} 4.5...24 VDC	Hall sensor 3
Pin 4	Motor winding 3	GND
Pin 5	Hall sensor 3	V_{Hall} 4.5...24 VDC
Pin 6	GND	N.C.
Pin 7	Motor winding 1	
Pin 8	Motor winding 2	
		V2 (motor, AWG 14)
Pin 1		Motor winding 1
Pin 2		Motor winding 2
Pin 3		Motor winding 3
Pin 4		N.C.

Wiring diagram for Hall sensors see p. 49

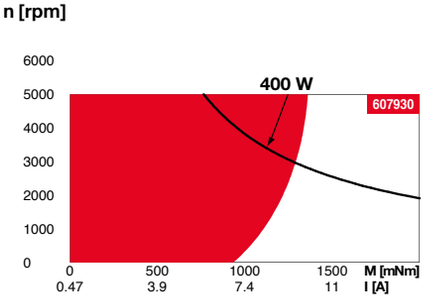
Connector		**Part number**
Molex	46015-0806	43025-0600
Molex		171692-0104

Connection cable for V1

Universal, L = 500 mm	**339380**
to EPOS4, L = 500 mm	**354045**

[1]Calculation does not include saturation effect (p. 61/168)

Operating Range



Comments

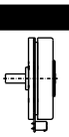
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 38



Encoder MILE
512 - 6400 CPT,
2 channels
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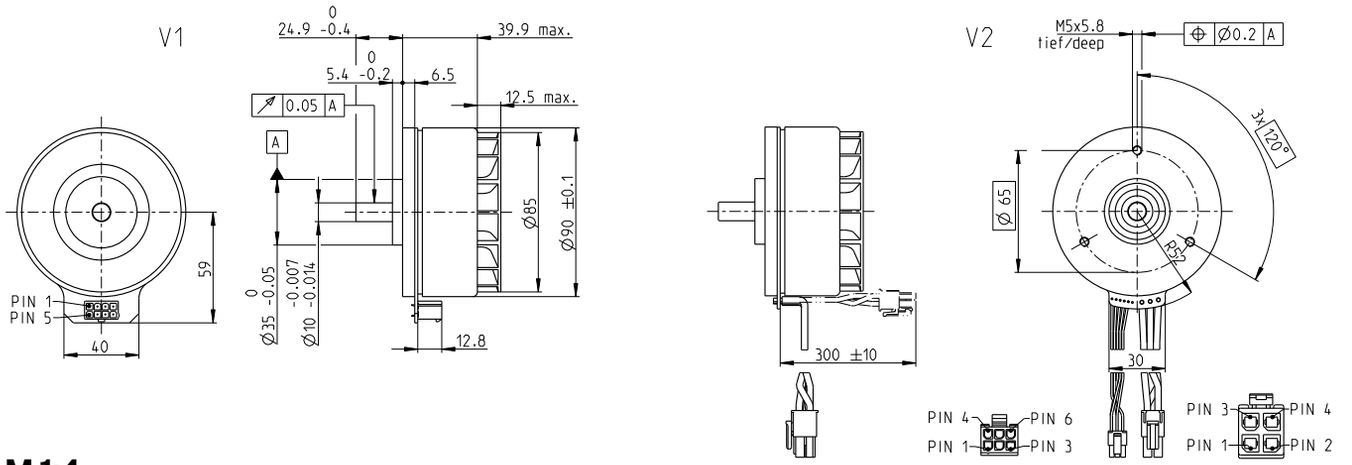
Recommended Electronics:

Notes	**Page 38**
ESCON Mod. 50/5	487
ESCON Mod. 50/8 (HE)	488
ESCON 50/5	489
ESCON 70/10	489
DEC Module 50/5	491
EPOS4 Mod./Comp. 50/5	496
EPOS4 Mod./Comp. 50/8	497
EPOS4 Mod./Comp. 50/15	500
EPOS4 50/5	501
EPOS4 70/15	501

*607933 cannot be combined with the MILE encoder, because the current limit of the connectors of the MILE circuit board is 13 A.

EC 90 flat ∅90 mm, brushless, 600 Watt

Ventilated



M 1:4

Stock program
Standard program
Special program (on request)

Part Numbers

V1 with Hall sensors		**597974**	597975	597976
V2 with Hall sensors and cables	607937	607938	607939	607940

Motor Data						
	Values at nominal voltage					
1	Nominal voltage	V	18	30	48	60
2	No load speed	rpm	2080	2080	1960	1980
3	No load current	mA	821	493	283	230
4	Nominal speed	rpm	1620	1620	1520	1540
5	Nominal torque (max. continuous torque)	mNm	1610	1560	1490	1500
6	Nominal current (max. continuous current)	A	18*	10.5	5.95	4.83
7	Stall torque[1]	mNm	14900	14600	13100	13300
8	Stall current	A	183	107	56.9	46.7
9	Max. efficiency	%	87.2	87	86.5	86.6
	Characteristics					
10	Terminal resistance phase to phase	Ω	0.0983	0.28	0.844	1.28
11	Terminal inductance phase to phase	mH	0.133	0.369	1.07	1.63
12	Torque constant	mNm/A	81.6	136	231	286
13	Speed constant	rpm/V	117	70.2	41.3	33.4
14	Speed/torque gradient	rpm/mNm	0.141	0.144	0.151	0.15
15	Mechanical time constant	ms	7.47	7.66	7.99	7.97
16	Rotor inertia	gcm²	5100	5100	5100	5060

Specifications

Thermal data

17	Thermal resistance housing-ambient	1.04 K/W
18	Thermal resistance winding-housing	0.89 K/W
19	Thermal time constant winding	27.9 s
20	Thermal time constant motor	255 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+125°C

Mechanical data (preloaded ball bearings)

23	Max. speed	5000 rpm
24	Axial play at axial load	0.14 mm
25	Radial play	preloaded
26	Max. axial load (dynamic)	34 N
27	Max. force for press fits (static)	440 N
	(static, shaft supported)	8000 N
28	Max. radial load, 10 mm from flange	130 N

Other specifications

29	Number of pole pairs	11
30	Number of phases	3
31	Weight of motor	988 g

Values listed in the table are nominal.

Connection V1		**V2** (sensors, AWG 24)
Pin 1	Hall sensor 1	Hall sensor 1
Pin 2	Hall sensor 2	Hall sensor 2
Pin 3	V_{Hall} 4.5...24 VDC	Hall sensor 3
Pin 4	Motor winding 3	GND
Pin 5	Hall sensor 3	V_{Hall} 4.5...24 VDC
Pin 6	GND	N.C.
Pin 7	Motor winding 1	
Pin 8	Motor winding 2	
		V2 (motor, AWG 14)
Pin 1		Motor winding 1
Pin 2		Motor winding 2
Pin 3		Motor winding 3
Pin 4		N.C.

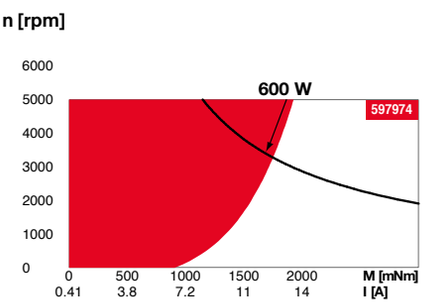
Wiring diagram for Hall sensors see p. 49

Connector		**Part number**
Molex	46015-0806	43025-0600
Molex		171692-0104

Connection cable for V1
Universal, L = 500 mm **339380**

[1]Calculation does not include saturation effect (p. 61/168)

Operating Range



Comments

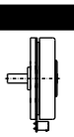
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Details on catalog page 38



Encoder MILE
512 - 6400 CPT,
2 channels
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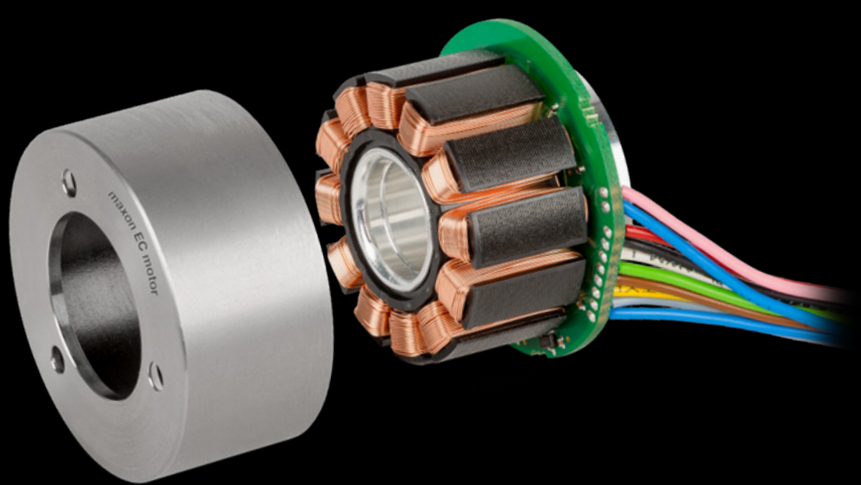
Recommended Electronics:

Notes	Page **38**
ESCON Mod. 50/5	487
ESCON Mod. 50/8 (HE)	488
ESCON 50/5	489
ESCON 70/10	489
DEC Module 50/5	491

*607937 cannot be combined with the MILE encoder, because the current limit of the connectors of the MILE circuit board is 13 A.

maxon frameless

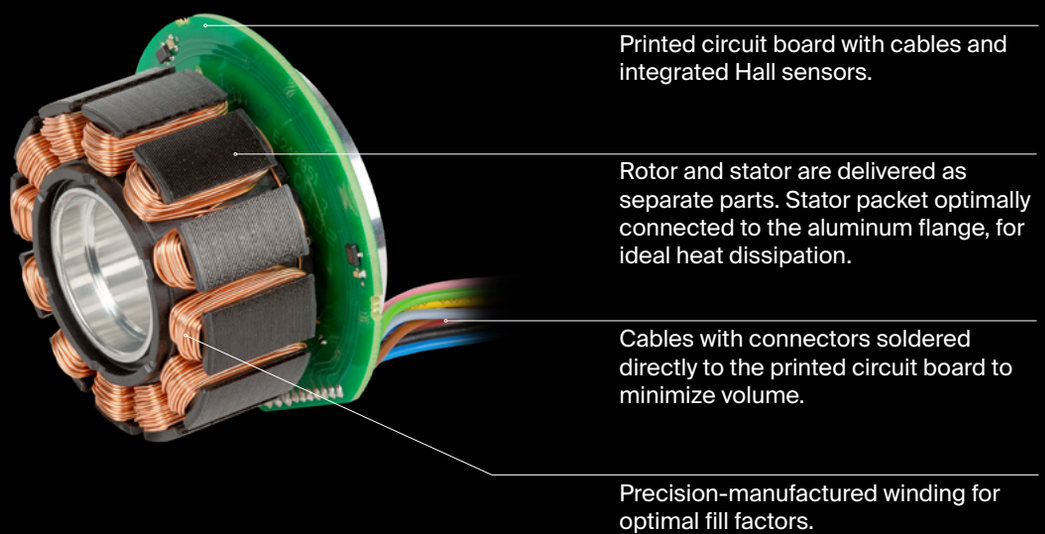


maxon EC frameless

Rotor and stator are delivered separately and connected only during the assembly of the components. Frameless motors offer maximum torque density and minimum size, high overload capability, low cogging torque, and enough space for cable glands.

Key data

Motor ∅	43 ... 90 mm
Motor length	20.55 ... 42 mm
Power	30 ... 260 W
Nominal torque	up to 1010 mNm
Max. permissible speed	up to 10 000 rpm



- → High torque density
- → Compact, with plenty of space inside
- → Low operating voltage
- → Complete control
- → Proven design

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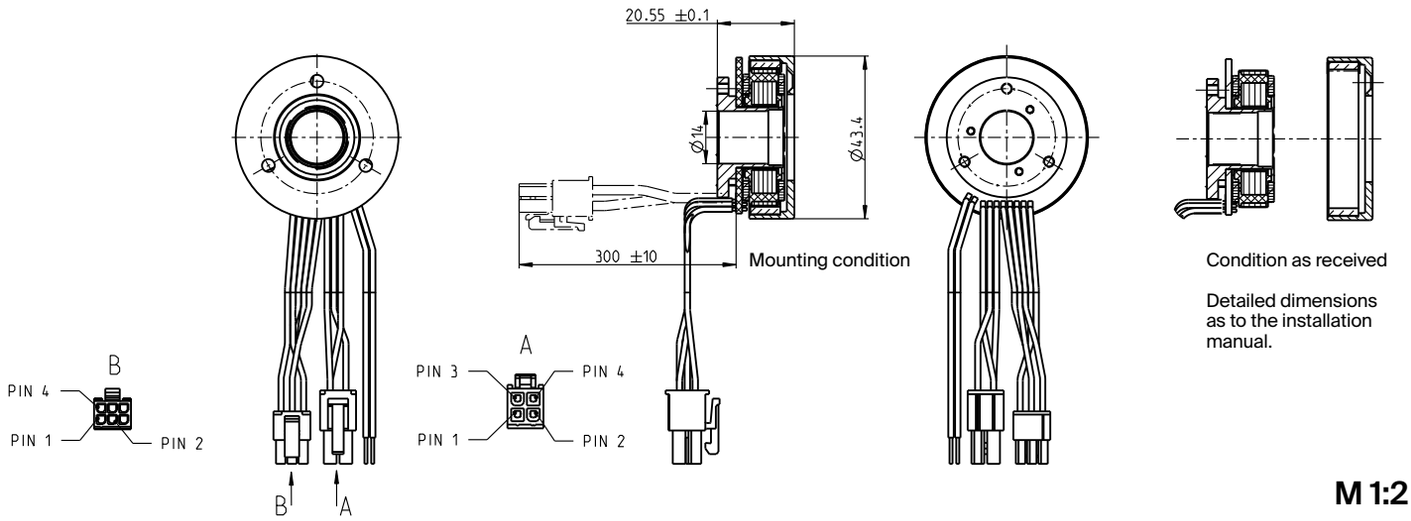
EC frameless 45 flat ∅43.4 mm, brushless, 30 Watt



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

	with Hall sensors	548273	574536	574537	574538
Motor Data					
	Values at nominal voltage				
1	Nominal voltage	V	12	18	24	36
2	No load speed	rpm	4360	4890	4360	4750
3	No load current	mA	163	129	81.4	61.6
4	Nominal speed	rpm	2910	3510	2930	3290
5	Nominal torque (max. continuous torque)	mNm	54.9	57.8	54.7	66
6	Nominal current (max. continuous current)	A	2.02	1.63	1.01	0.847
7	Stall torque	mNm	247	295	251	378
8	Stall current	A	9.69	8.61	4.93	5.35
9	Max. efficiency	%	76.3	77.5	76.5	80.1
	Characteristics					
10	Terminal resistance phase to phase	Ω	1.24	2.09	4.87	6.73
11	Terminal inductance phase to phase	mH	0.56	0.697	2.24	4.29
12	Torque constant	mNm/A	25.5	34.3	51	70.6
13	Speed constant	rpm/V	374	278	187	135
14	Speed/torque gradient	rpm/mNm	18.2	17	17.9	12.9
15	Mechanical time constant	ms	28.6	30.8	28.1	20.2
16	Rotor inertia	gcm²	150	150	150	150

Specifications

	Thermal data	
17	Thermal resistance housing-ambient	6.73 K/W
18	Thermal resistance winding-housing	3.92 K/W
19	Thermal time constant winding	11.4 s
20	Thermal time constant motor	296 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+125°C
	Mechanical data	
23	Max. speed	10 000 rpm
	Other specifications	
29	Number of pole pairs	8
30	Number of phases	3
31	Weight of motor	89 g
	Weight of rotor	35 g
	Weight of stator	54 g

Values listed in the table are nominal.

Connection motor (Cable AWG 24)

red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

Connector	**Part number**
Molex	39-01-2040

Connection sensors (Cable AWG 24)

yellow	Hall sensor 1*	Pin 1
brown	Hall sensor 2*	Pin 2
grey	Hall sensor 3*	Pin 3
blue	GND	Pin 4
green	V_{Hall} 4.5...24 VDC	Pin 5
	N.C.	Pin 6

Connector	**Part number**
Molex	430-25-0600

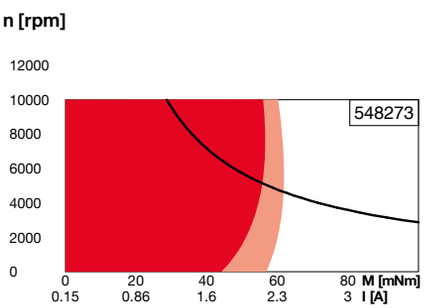
Wiring diagram for Hall sensors see p. 49
*Internal pull-up (7...13 kΩ) on pin 5

Connection NTC (Cable AWG 24)

pink	NTC
blue	NTC

Resistance 25°C: 5 kΩ ±1%, beta (25–85°C): 3490 K

Operating Range



Continuous operation
Continuous operation with reduced thermal resistance R_{th2} 50%
Intermittent operation

Assigned power rating

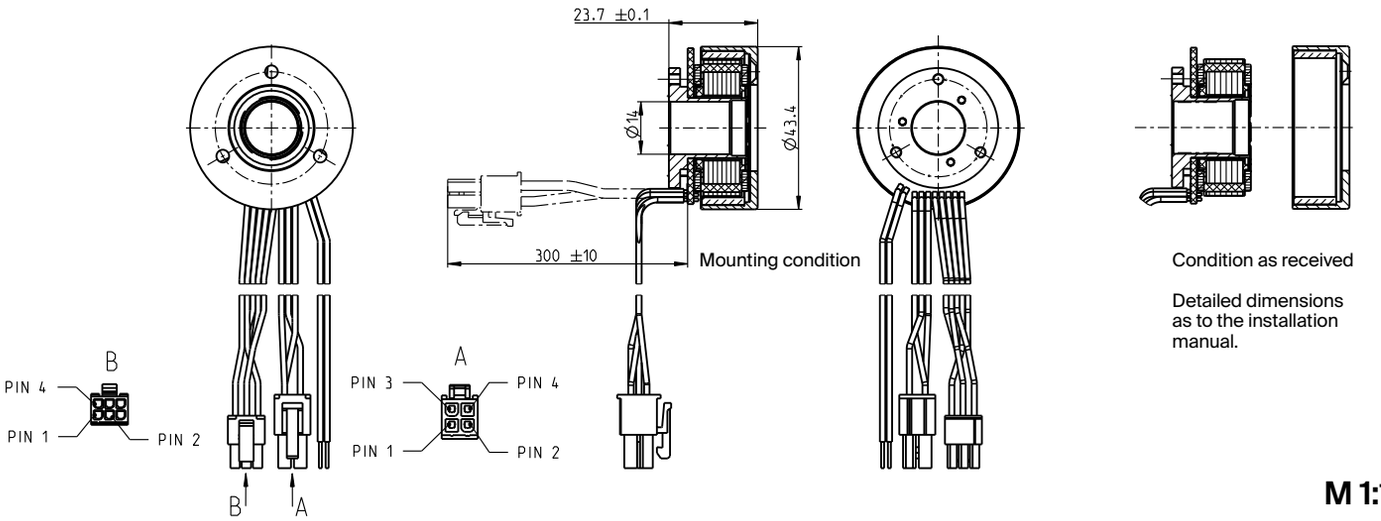
Comments

maxon Modular System Details on catalog page 38

Recommended Electronics:

Notes	Page **38**
ESCON Module 24/2	486
ESCON 36/3 EC	487
ESCON Mod. 50/4 EC-S	487
ESCON Module 50/5	487
ESCON 50/5	489
DEC Module 24/2	491
DEC Module 50/5	491
EPOS4 Micro 24/5	495
EPOS4 Mod./Comp. 24/1.5	496
EPOS4 Mod./Comp. 50/5	496
EPOS4 Comp. 24/5 3-axes	497
EPOS4 50/5	501
EPOS2 P 24/5	504

EC frameless 45 flat ∅43.4 mm, brushless, 50 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

with Hall sensors	543631	574402	574403	574404
Motor Data				
Values at nominal voltage				
1 Nominal voltage V	18	24	24	36
2 No load speed rpm	6720	6710	4730	3360
3 No load current mA	247	185	106	42.3
4 Nominal speed rpm	5190	5240	3480	2360
5 Nominal torque (max. continuous torque) mNm	97.1	83.4	69.6	90.5
6 Nominal current (max. continuous current) A	3.52	2.33	1.41	0.828
7 Stall torque mNm	975	780	402	484
8 Stall current A	38.8	23.3	8.47	4.81
9 Max. efficiency %	85	83.3	79.3	82.4
Characteristics				
10 Terminal resistance phase to phase Ω	0.464	1.03	2.83	7.48
11 Terminal inductance phase to phase mH	0.322	0.572	1.15	5.15
12 Torque constant mNm/A	25.1	33.5	47.5	101
13 Speed constant rpm/V	380	285	201	95
14 Speed/torque gradient rpm/mNm	7.02	8.77	12	7.07
15 Mechanical time constant ms	13.6	17	23.3	13.7
16 Rotor inertia gcm²	185	185	185	185

Specifications

Thermal data

17	Thermal resistance housing-ambient	4.53 K/W
18	Thermal resistance winding-housing	4.75 K/W
19	Thermal time constant winding	17.7 s
20	Thermal time constant motor	227 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+125°C

Mechanical data

23	Max. speed	10 000 rpm

Other specifications

29	Number of pole pairs	8
30	Number of phases	3
31	Weight of motor	110 g
	Weight of rotor	41 g
	Weight of stator	69 g

Values listed in the table are nominal.

Connection motor (Cable AWG 24)

red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

Connector	**Part number**
Molex	39-01-2040

Connection sensors (Cable AWG 24)

yellow	Hall sensor 1*	Pin 1
brown	Hall sensor 2*	Pin 2
grey	Hall sensor 3*	Pin 3
blue	GND	Pin 4
green	V_{Hall} 4.5...24 VDC	Pin 5
	N.C.	Pin 6

Connector	**Part number**
Molex	430-25-0600

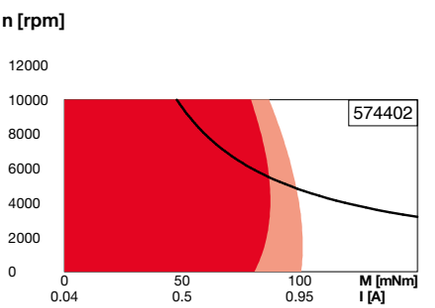
Wiring diagram for Hall sensors see p. 49
*Internal pull-up (7...13 kΩ) on pin 5

Connection NTC (Cable AWG 24)

pink	NTC
blue	NTC

Resistance 25°C: 5 kΩ ±1%, beta (25–85°C): 3490 K

Operating Range



Comments

Continuous operation
Continuous operation with reduced thermal resistance R_{th2} 50%
Intermittent operation

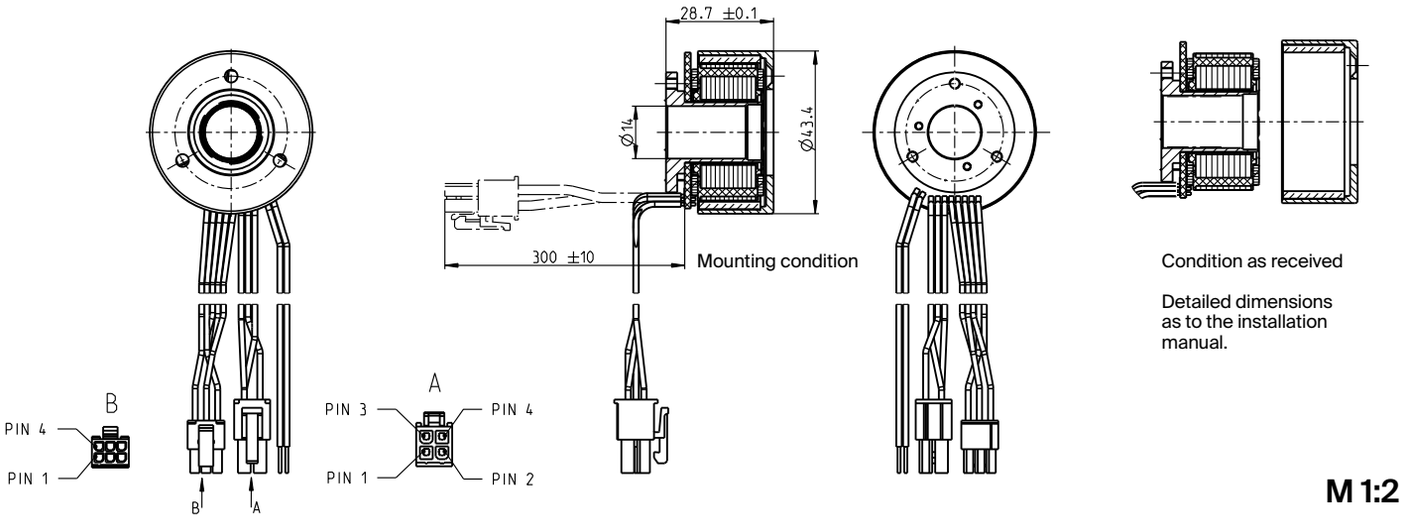
Assigned power rating

maxon Modular System Details on catalog page 38

Recommended Electronics:

Notes	Page **38**
ESCON Module 24/2	486
ESCON 36/3 EC	487
ESCON Mod. 50/4 EC-S	487
ESCON Module 50/5	487
ESCON 50/5	489
DEC Module 24/2	491
DEC Module 50/5	491
EPOS4 Micro 24/5	495
EPOS4 Mod./Comp. 24/1.5	496
EPOS4 Mod./Comp. 50/5	496
EPOS4 Comp. 24/5 3-axes	497
EPOS4 50/5	501
EPOS2 P 24/5	504

EC frameless 45 flat ∅43.4 mm, brushless, 70 Watt



Stock program
Standard program
Special program (on request)

Part Numbers

with Hall sensors	548270	574035	574036	574037
Motor Data				
Values at nominal voltage				
1 Nominal voltage V	24	30	36	48
2 No load speed rpm	6110	6230	6330	3440
3 No load current mA	234	194	166	48.1
4 Nominal speed rpm	4860	4990	5080	2540
5 Nominal torque (max. continuous torque) mNm	128	112	108	134
6 Nominal current (max. continuous current) A	3.21	2.36	1.93	0.936
7 Stall torque mNm	1460	1170	1100	915
8 Stall current A	39.5	25.8	20.7	6.97
9 Max. efficiency %	85.4	83.7	83.2	84.3
Characteristics				
10 Terminal resistance phase to phase Ω	0.608	1.16	1.74	6.89
11 Terminal inductance phase to phase mH	0.463	0.691	0.966	5.85
12 Torque constant mNm/A	36.9	45.1	53.3	131
13 Speed constant rpm/V	259	212	179	72.7
14 Speed/torque gradient rpm/mNm	4.26	5.44	5.85	3.82
15 Mechanical time constant ms	10.7	13.7	14.7	9.6
16 Rotor inertia gcm²	240	240	240	240

Specifications

Thermal data

17	Thermal resistance housing-ambient	3.56 K/W
18	Thermal resistance winding-housing	4.1 K/W
19	Thermal time constant winding	29.6 s
20	Thermal time constant motor	178 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+125°C

Mechanical data

23	Max. speed	10 000 rpm

Other specifications

29	Number of pole pairs	8
30	Number of phases	3
31	Weight of motor	143 g
	Weight of rotor	51 g
	Weight of stator	92 g

Values listed in the table are nominal.

Connection motor (Cable AWG 24)

red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

Connector	**Part number**
Molex	39-01-2040

Connection sensors (Cable AWG 24)

yellow	Hall sensor 1*	Pin 1
brown	Hall sensor 2*	Pin 2
grey	Hall sensor 3*	Pin 3
blue	GND	Pin 4
green	V_{Hall} 4.5...24 VDC	Pin 5
	N.C.	Pin 6

Connector	**Part number**
Molex	430-25-0600

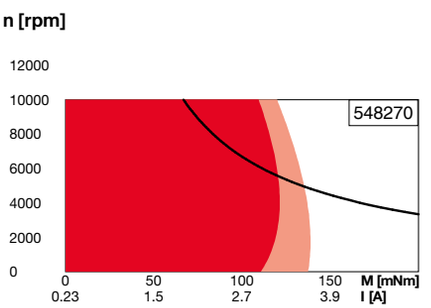
Wiring diagram for Hall sensors see p. 49
*Internal pull-up (7...13 kΩ) on pin 5

Connection NTC (Cable AWG 24)

pink	NTC
blue	NTC

Resistance 25°C: 5 kΩ ±1%, beta (25–85°C): 3490 K

Operating Range



Comments

Continuous operation
Continuous operation with reduced thermal resistance R_{th2} 50%
Intermittent operation

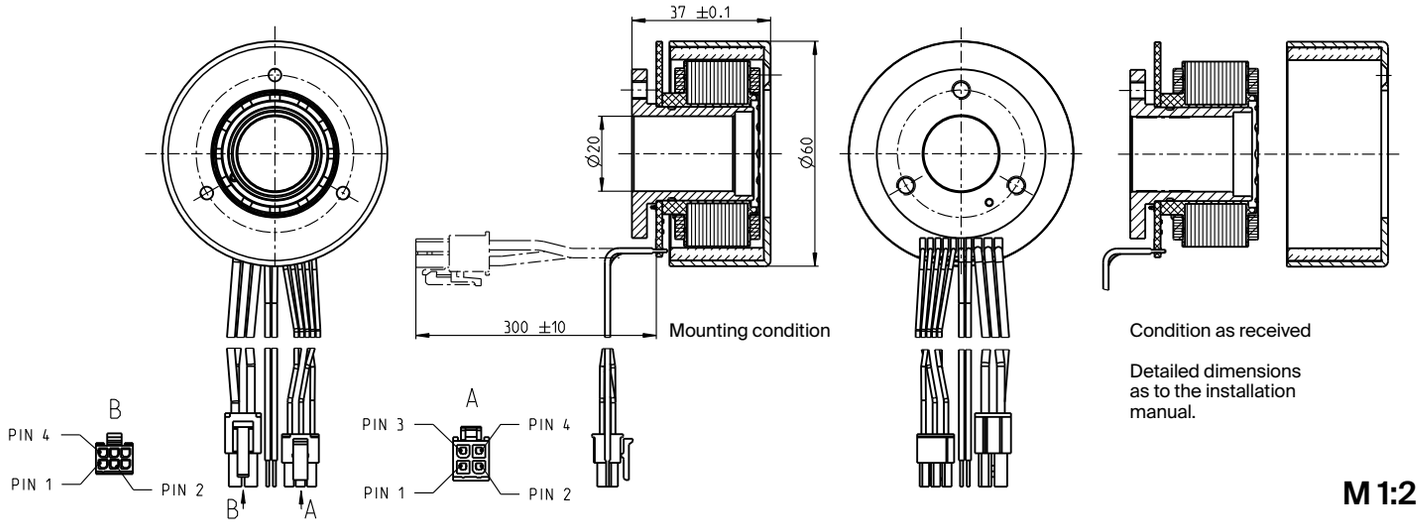
Assigned power rating

maxon Modular System Details on catalog page 38

Recommended Electronics:

Notes	Page **38**
ESCON 36/3 EC	487
ESCON Mod. 50/4 EC-S	487
ESCON Module 50/5	487
ESCON 50/5	489
DEC Module 50/5	491
EPOS4 Micro 24/5	495
EPOS4 Mod./Comp. 50/5	496
EPOS4 Comp. 24/5 3-axes	497
EPOS4 50/5	501
EPOS2 P 24/5	504

EC frameless 60 flat ∅60 mm, brushless, 100 Watt



Stock program
Standard program
Special program (on request)

			Part Numbers								
		with Hall sensors	550153	542002	550154						
Motor Data											
	Values at nominal voltage										
1	Nominal voltage	V	12	24	48						
2	No load speed	rpm	3710	4250	3970						
3	No load current	mA	671	419	187						
4	Nominal speed	rpm	3170	3740	3490						
5	Nominal torque (max. continuous torque)	mNm	279	289	319						
6	Nominal current (max. continuous current)	A	9.25	5.47	2.78						
7	Stall torque	mNm	2850	4180	5010						
8	Stall current	A	93.5	78.2	43.8						
9	Max. efficiency	%	84	86	88						
	Characteristics										
10	Terminal resistance phase to phase	Ω	0.128	0.307	1.1						
11	Terminal inductance phase to phase	mH	0.062	0.188	0.864						
12	Torque constant	mNm/A	30.5	53.4	114						
13	Speed constant	rpm/V	313	179	83.4						
14	Speed/torque gradient	rpm/mNm	1.32	1.03	0.798						
15	Mechanical time constant	ms	17.2	13.4	10.4						
16	Rotor inertia	gcm²	1246	1246	1246						

Specifications

Thermal data

17	Thermal resistance housing-ambient	2.5 K/W
18	Thermal resistance winding-housing	3.8 K/W
19	Thermal time constant winding	40 s
20	Thermal time constant motor	89.9 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+125°C

Mechanical data

23	Max. speed	6000 rpm

Other specifications

29	Number of pole pairs	7
30	Number of phases	3
31	Weight of motor	333 g
	Weight of rotor	160 g
	Weight of stator	173 g

Values listed in the table are nominal.

Connection motor (Cable AWG 18)

red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

Connector	**Part number**
Molex	39-01-2040

Connection sensors (Cable AWG 24)

yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V_{Hall} 4.5...24 VDC	Pin 5
	N.C.	Pin 6

Connector	**Part number**
Molex	430-25-0600

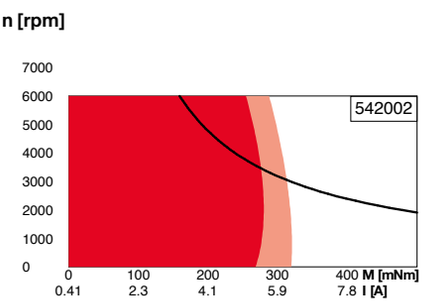
Wiring diagram for Hall sensors see p. 49

Connection NTC (Cable AWG 24)

pink	NTC
blue	NTC

Resistance 25°C: 5 kΩ ±1%, beta (25–85°C): 3490 K

Operating Range



Continuous operation
Continuous operation with reduced thermal resistance R_{th2} 50%
Intermittent operation

Assigned power rating

Comments

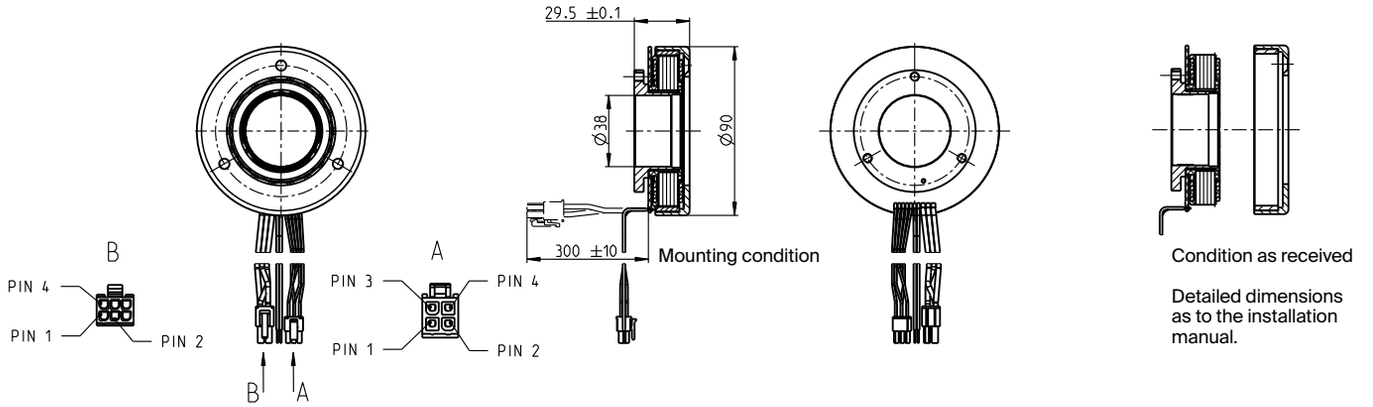
maxon Modular System

Details on catalog page 38

Recommended Electronics:

Notes	Page **38**
ESCON Mod. 50/4 EC-S	487
ESCON Mod. 50/5	487
ESCON Mod. 50/8 (HE)	488
ESCON 50/5	489
ESCON 70/10	489
DEC Module 50/5	491
EPOS4 Mod./Comp. 50/5	496
EPOS4 Mod./Comp. 50/8	499
EPOS4 50/5	501
EPOS4 70/15	501
EPOS2 P 24/5	504

EC frameless 90 flat ∅90 mm, brushless, 160 Watt



M 1:4

Stock program
Standard program
Special program (on request)

			Part Numbers							
		with Hall sensors	588847	543673	581301	581302				
Motor Data										
	Values at nominal voltage									
1	Nominal voltage	V	12	24	36	60				
2	No load speed	rpm	3160	3170	3070	2600				
3	No load current	mA	1320	658	420	197				
4	Nominal speed	rpm	2670	2710	2630	2200				
5	Nominal torque (max. continuous torque)	mNm	458	458	453	460				
6	Nominal current (max. continuous current)	A	12.8	6.39	4.09	2.1				
7	Stall torque	mNm	6260	7540	7430	6380				
8	Stall current	A	176	106	67.5	29.4				
9	Max. efficiency	%	83	85	85	84				
	Characteristics									
10	Terminal resistance phase to phase	Ω	0.0682	0.226	0.533	2.04				
11	Terminal inductance phase to phase	mH	0.058	0.232	0.554	2.15				
12	Torque constant	mNm/A	35.6	71.2	110	217				
13	Speed constant	rpm/V	268	134	86.8	44.1				
14	Speed/torque gradient	rpm/mNm	0.514	0.427	0.421	0.414				
15	Mechanical time constant	ms	17.1	14.2	14	13.8				
16	Rotor inertia	gcm²	3170	3170	3170	3170				

Specifications

Thermal data

17	Thermal resistance housing-ambient	1.77 K/W
18	Thermal resistance winding-housing	3.71 K/W
19	Thermal time constant winding	69.6 s
20	Thermal time constant motor	263 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+125°C

Mechanical data

23	Max. speed	5000 rpm

Other specifications

29	Number of pole pairs	11
30	Number of phases	3
31	Weight of motor	490 g
	Weight of rotor	195 g
	Weight of stator	295 g

Values listed in the table are nominal.

Connection motor (Cable AWG 16)

red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

Connector	**Part number**
Molex	39-01-2040

Connection sensors (Cable AWG 24)

yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V_{Hall} 4.5...24 VDC	Pin 5
	N.C.	Pin 6

Connector	**Part number**
Molex	430-25-0600

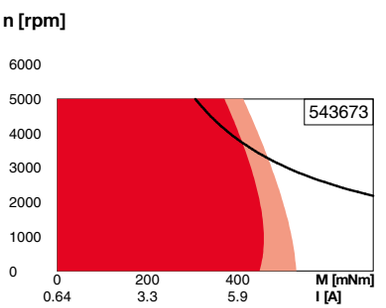
Wiring diagram for Hall sensors see p. 49

Connection NTC (Cable AWG 24)

pink	NTC
blue	NTC

Resistance 25°C: 5 kΩ ±1%, beta (25–85°C): 3490 K

Operating Range



Continuous operation
Continuous operation with reduced thermal resistance R_{th2} 50%
Intermittent operation

Assigned power rating

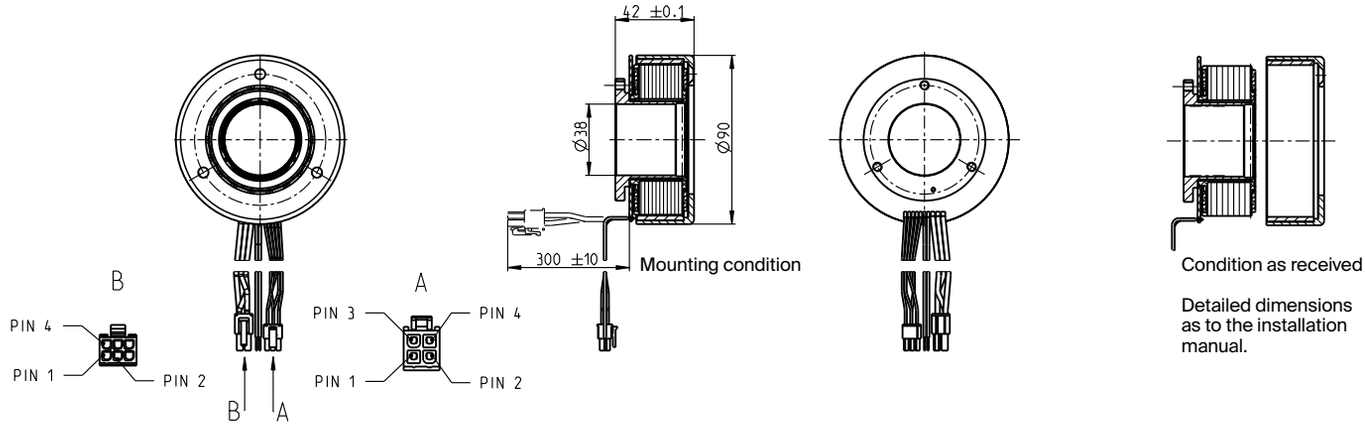
Comments

maxon Modular System Details on catalog page 38

Recommended Electronics:

Notes	Page **38**
ESCON Mod. 50/4 EC-S	487
ESCON Mod. 50/5	487
ESCON Mod. 50/8 (HE)	488
ESCON 50/5	489
ESCON 70/10	489
DEC Module 50/5	491
EPOS4 Mod./Comp. 50/5	496
EPOS4 Mod./Comp. 50/8	499
EPOS4 50/5	501
EPOS4 70/15	501
EPOS2 P 24/5	504

EC frameless 90 flat ∅90 mm, brushless, 260 Watt



M 1:4

Stock program
Standard program
Special program (on request)

Part Numbers

	with Hall sensors	588849	542099	581294	581295
Motor Data					
	Values at nominal voltage				
1	Nominal voltage V	18	30	48	60
2	No load speed rpm	2100	2080	1960	1980
3	No load current mA	830	490	278	227
4	Nominal speed rpm	1770	1770	1660	1690
5	Nominal torque (max. continuous torque) mNm	1010	988	964	963
6	Nominal current (max. continuous current) A	12.1	7.06	4.06	3.28
7	Stall torque mNm	13400	14100	13000	13200
8	Stall current A	166	103	56.2	46.3
9	Max. efficiency %	86	87	86	86
	Characteristics				
10	Terminal resistance phase to phase Ω	0.109	0.29	0.854	1.29
11	Terminal inductance phase to phase mH	0.133	0.369	1.07	1.63
12	Torque constant mNm/A	80.7	136	231	286
13	Speed constant rpm/V	118	70.2	41.3	33.4
14	Speed/torque gradient rpm/mNm	0.159	0.15	0.153	0.152
15	Mechanical time constant ms	8.85	8.32	8.47	8.41
16	Rotor inertia gcm²	5300	5300	5300	5300

Specifications

Thermal data

17	Thermal resistance housing-ambient	1.74 K/W
18	Thermal resistance winding-housing	1.82 K/W
19	Thermal time constant winding	60.5 s
20	Thermal time constant motor	258 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+125°C

Mechanical data

23	Max. speed	5000 rpm

Other specifications

29	Number of pole pairs	11
30	Number of phases	3
31	Weight of motor	814 g
	Weight of rotor	292 g
	Weight of stator	522 g

Values listed in the table are nominal.

Connection motor (Cable AWG 16)

red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

Connector	**Part number**
Molex	39-01-2040

Connection sensors (Cable AWG 24)

yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V_{Hall} 4.5...24 VDC	Pin 5
	N.C.	Pin 6

Connector	**Part number**
Molex	430-25-0600

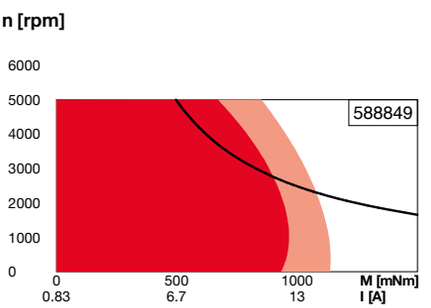
Wiring diagram for Hall sensors see p. 49

Connection NTC (Cable AWG 24)

pink	NTC
blue	NTC

Resistance 25°C: 5 kΩ ±1%, beta (25–85°C): 3490 K

Operating Range



Continuous operation
Continuous operation with reduced thermal resistance R_{th2} 50%
Intermittent operation

Assigned power rating

Comments

maxon Modular System

Details on catalog page 38

Recommended Electronics:

Notes	Page **38**
ESCON Mod. 50/4 EC-S	487
ESCON Mod. 50/5	487
ESCON Mod. 50/8 (HE)	488
ESCON 50/5	489
ESCON 70/10	489
DEC Module 50/5	491
EPOS4 Mod./Comp. 50/5	496
EPOS4 Mod./Comp. 50/8	499
EPOS4 Mod./Comp. 50/15	500
EPOS4 50/5	501
EPOS4 70/15	501
EPOS2 P 24/5	504

Compact drives with integrated positioning/speed controller

Explanation of maxon IDX drives terminology

Dimensional drawings
Presentation of the views according to the projection method E (ISO).  All dimensions in [mm].

Drive data
The values were determined for sinusoidal commutation and a drive without additional attachments, such as a brake or gearhead. Additional attachments may change the performance data of the system.

1 **Nominal power supply voltage** U_N [Volt]
is the supply voltage at which the nominal values of the drive are achieved. The nominal values (lines 2-7) are based on this voltage. The supply voltage may vary within the range of the nominal operating voltage (line 12).

2 **Nominal speed** n_N [rpm]
is the speed for which the drive is rated. For torques up to the nominal torque, the integrated motor controller is capable of regulating to this speed.

3 **Nominal torque at 25°C (max. continuous torque)** [mNm]
and
4 **Nominal torque at 40 °C (max. continuous torque)** [mNm]
is the torque generated during operation with the nominal supply voltage and nominal supply current at 25 °C/40 °C. It is at the limit of the drive's continuous operation range. To prevent the winding from heating up too much, higher torques are only possible for brief periods. The integrated motor controller monitors the winding with a temperature sensor.

5 **Nominal supply current at 25 °C** [A]
and
6 **Nominal supply current at 40 °C** [A]
is the supply current required to reach the nominal torque with the nominal supply voltage at 25 °C/40 °C.

7 **Maximum speed with nominal supply voltage** [rpm]
is the maximum speed the drive can achieve at the nominal supply voltage.

8 **Maximum permissible drive speed** n_{max} [rpm]
is the maximum speed the drive can achieve. The maximum speed can only be achieved if a sufficiently high supply voltage is available. Higher speeds are not permitted.

9 **Maximum torque (short-term)** M_{max} [mNm]
is the torque that the drive can output for short periods of time. The duration depends on the installation and is monitored by the integrated motor controller using temperature sensors.

10 **Maximum supply current (short term)** I_{max} [A]
is the maximum current. The supply current is not proportional to the torque, but instead depends on the supply voltage and the operating point.

11 **Rotor moment of inertia** J_R [gcm^2]
is the mass moment of inertia of the rotor, based on the axis of rotation.

12 **Nominal supply voltage** $+V_{CC}$ [V]
shows the permitted range for the supply voltage relative to GND. If the actual voltage is lower than the nominal supply voltage, then the nominal torque and speed cannot be guaranteed. If a brake is attached, then the supply voltage of the brake is considered to be the lower limit (see feature chart).

13 **Ramp-up time to maximum speed** [ms]
is the time required to accelerate rotor to the maximum speed under no load. This time only applies if there is an adequate supply voltage, without brake and without gearhead.

14 **Thermal resistance housing-ambient** R_{th2} [K/W]
and
15 **Thermal resistance winding-housing** R_{th1} [K/W]
Characteristic values of thermal contact resistance without additional heat sinking. Lines 14 and 15 combined define the maximum heating at a given power loss (load). Thermal resistance R_{th2} on motors with metal flanges can decrease by up to 80% if the motor is coupled directly to a good heat-conducting (e.g. metallic) mounting rather than a plastic panel.

16 **Thermal time constant of winding** τ_w [s]
and
17 **Thermal time constant of drive** τ_s [s]
These are the typical response times for temperature changes of the winding and drive. It is noticeable that the drive has a much slower thermal response than the winding. The values have been calculated from the product of the thermal capacity and the given heat resistances. The integrated motor controller monitors the temperatures with temperature sensors.

18 **Ambient temperature** [°C]
Operating temperature range. This derives from the heat reliability of the materials used and viscosity of bearing lubrication.

19 **Axial play** [mm]
On motors that are not preloaded, these are the tolerance limits for the bearing play. A preload cancels out the axial play up to the specified axial force. When load is applied in the direction of the preload force (away from the flange), the axial play is always zero. The length tolerance of the shaft includes the maximum axial play.

20 **Radial play** [mm]
Radial play is the bearing's radial movement. A spring is utilized to preload the motor's bearings, eliminating radial play up to a given axial load.

21/22 **Max. axial load** [N]
Dynamically: axial loading permissible in operation. If different values apply for traction and thrust, the smaller value is given.
Statically: maximum axial force applying to the shaft at standstill where no residual damage occurs.

23 **Max. radial load** [N]
The value is given for a typical clearance from the flange; this value falls the greater the clearance.

24 **Weight of motor** [g]

25 **Typical noise level** [dBA]
is the statistical average of the noise level measured in accordance with the maxon standard (10 cm distance radially to the drive, no-load operation at the given speed.) The drive lies freely on a plastic foam mat in the noise chamber). The acoustic noise level depends on a number of factors, such as component tolerances, and it is greatly influenced by the overall system in which the drive is installed. When the drive is installed in an unfavorable constellation, the noise level may be significantly higher than the noise level of the drive alone. The acoustic noise level is measured and determined during product qualification. In manufacturing, a structure-borne noise test is performed with defined limits. Impermissible deviations can thus be identified.

maxon IDX

Drive with positioning/speed controller

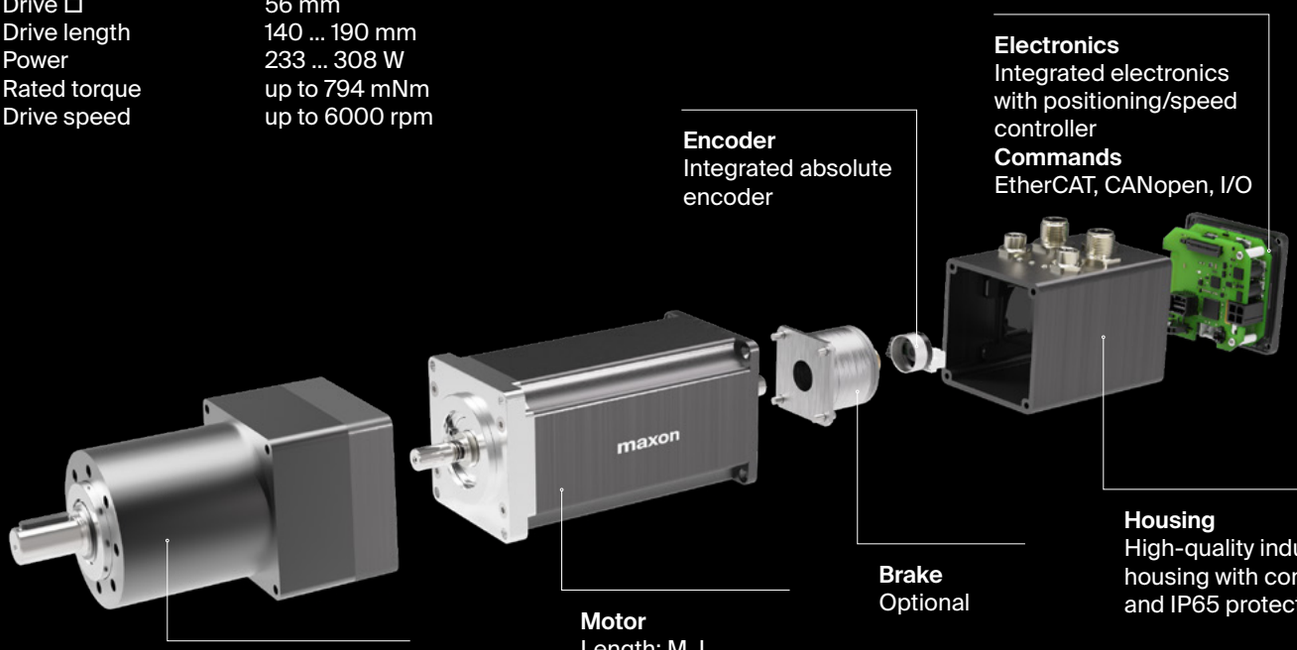
maxon IDX

Drive with positioning/speed controller

A maintenance-free positioning drive with proven components. The compact brushless EC-i motor combined with an EPOS4 positioning controller makes for a highly-dynamic, powerful drive package with field-oriented control (FOC), a high level of efficiency, and maintenance-free components in high-quality industrial housing.

Key data

Drive ☐	56 mm
Drive length	140 ... 190 mm
Power	233 ... 308 W
Rated torque	up to 794 mNm
Drive speed	up to 6000 rpm



Electronics
Integrated electronics with positioning/speed controller
Commands
EtherCAT, CANopen, I/O

Encoder
Integrated absolute encoder

Housing
High-quality industrial housing with connectors and IP65 protection class

Brake
Optional

Motor
Length: M, L
Winding: 24 V, 48 V
Flange: A-Flange, C-Flange

Gear
Stages: 1–3
Versions: Standard, Noise reduced, Ultra performance

- → High continuous torque
- → High power density
- → IP65-protected design
- → Ready for Industry 4.0
- → Easily configured online

shop.maxongroup.com

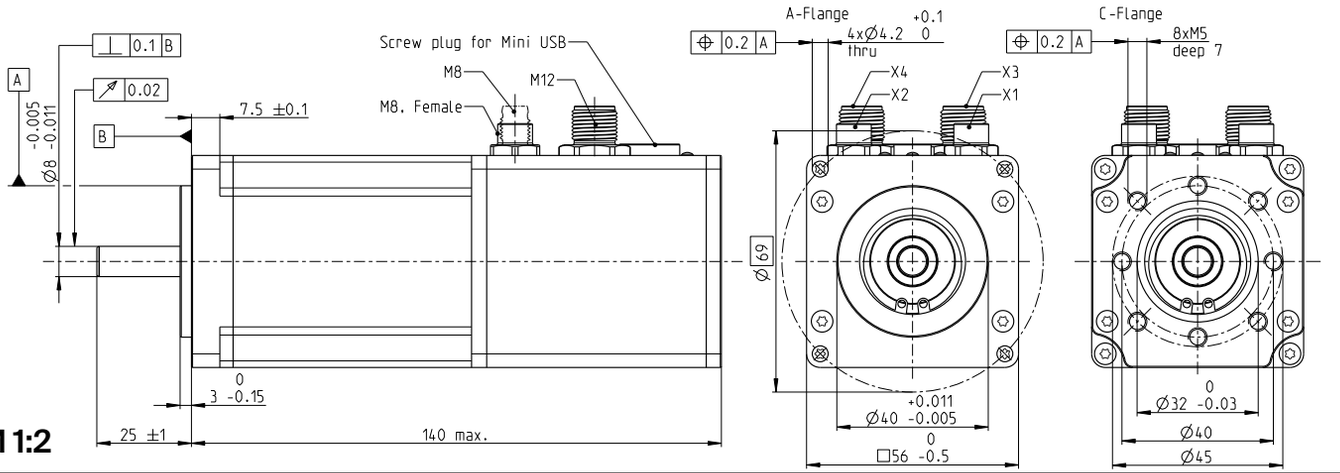
IDX 56 M with integrated electronics

Drive with Positioning/Speed Controller

Key Data: 233/256 W, 516 mNm, 6000 rpm

NEW

IDX



M 1:2

	Drive data (provisional)			
1_	Nominal power supply voltage	V	24	48
2_	Nominal speed	rpm	4500	4500
3_	Nominal torque at 25°C (max. continuous torque)	mNm	417	516
4_	Nominal torque at 40°C (max. continuous torque)	mNm	370	458
5_	Nominal supply current at 25°C	A	9.8	5.8
6_	Nominal supply current at 40°C	A	8.7	5.2
7_	Maximum speed at nominal voltage	rpm	5105	6000
8_	Maximum permissible drive speed	rpm	6000	6000
9_	Maximum torque (short-time)	mNm	888	1498
10_	Maximum supply current (short-time)	A	24	24
11_	Rotor inertia of the drive	gcm²	170	170
12_	Nominal supply voltage + V_{CC}	V	12..48	12..48
13_	Run-up time to maximum speed	ms	9.8	7.1

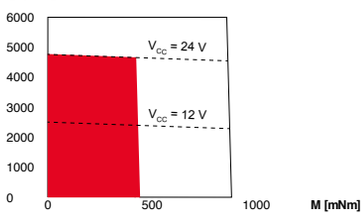
	Thermal data		
14_	Thermal resistance housing-ambient	K/W	2.47
15_	Thermal resistance winding-housing	K/W	1.16
16_	Thermal time constant winding	s	18.9
17_	Thermal time constant drive	s	1320
18_	Ambient temperature	°C	-20...+85
	Mechanical data		
19_	Axial play	mm	0.14
	Preload	N	21
	Direction of force		Pull
20_	Radial play		preloaded
21_	Max. axial load (dynamic)	N	12
22_	Max. force for press fits (static)	N	150
23_	Max. radial load [mm from flange]	N	110 [12.5]

	Other specifications		
24_	Weight of the drive	g	1070
25_	Typical noise level [rpm]	dBA	54 [4000]
	Encoder: Steps per turn		4096

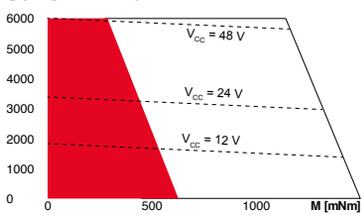
Supply	M12, male, 5 poles, L-coded
I/O's	M12, male, 12 poles, A-coded
CANopen Input	M8, male, 5 poles, B-coded
CANopen Output	M8, female, 5 poles, B-coded
EtherCAT Input	M8, female, 4 poles, A-coded
EtherCAT Output	M8, female, 4 poles, A-coded

Operating Range

n [rpm] 24-V-system



n [rpm] 48-V-system



Continuous operation
Short term operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon brake
354_GPX 52 A/UP	1–3	522_AB 34
355_GPX 52 LN	1–3	

Configuration

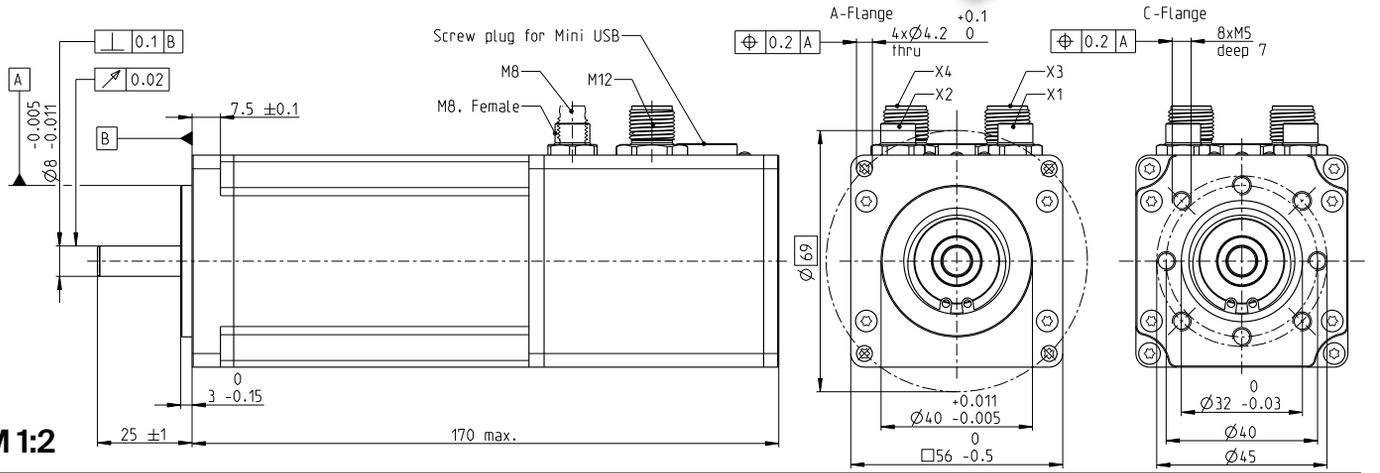
Flange front: A-Flange/C-Flange
Interfaces: CANopen / EtherCAT

IDX 56 L with integrated electronics

Drive with Positioning/Speed Controller

Key Data: 283/308 W, 794 mNm, 6000 rpm

NEW



M 1:2

	Drive data (provisional)			
1_	Nominal power supply voltage	V	24	48
2_	Nominal speed	rpm	2750	3500
3_	Nominal torque at 25°C (max. continuous torque)	mNm	794	779
4_	Nominal torque at 40°C (max. continuous torque)	mNm	704	690
5_	Nominal supply current at 25°C	A	11.2	6.7
6_	Nominal supply current at 40°C	A	10	6.0
7_	Maximum speed at nominal voltage	rpm	3090	4915
8_	Maximum permissible drive speed	rpm	6000	5000
9_	Maximum torque (short-time)	mNm	1596	1997
10_	Maximum supply current (short-time)	A	24	24
11_	Rotor inertia of the drive	gcm²	265	265
12_	Nominal supply voltage + V_{CC}	V	12..48	12..48
13_	Run-up time to maximum speed	ms	5.4	6.9

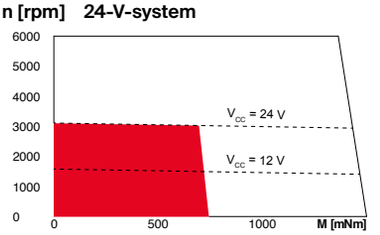
	Thermal data		
14_	Thermal resistance housing-ambient	K/W	2.01
15_	Thermal resistance winding-housing	K/W	0.76
16_	Thermal time constant winding	s	20.1
17_	Thermal time constant drive	s	1450
18_	Ambient temperature	°C	-20...+85
	Mechanical data		
19_	Axial play	mm	0.14
	Preload	N	21
	Direction of force		Pull
20_	Radial play		preloaded
21_	Max. axial load (dynamic)	N	12
22_	Max. force for press fits (static)	N	150
23_	Max. radial load [mm from flange]	N	110 [12.5]

	Other specifications		
24_	Weight of the drive	g	1445
25_	Typical noise level [rpm]	dBA	58 [4000]
	Encoder: Steps per turn		4096

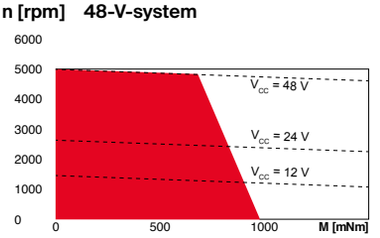
Supply	M12, male, 5 poles, L-coded
I/O's	M12, male, 12 poles, A-coded
CANopen Input	M8, male, 5 poles, B-coded
CANopen Output	M8, female, 5 poles, B-coded
EtherCAT Input	M8, female, 4 poles, A-coded
EtherCAT Output	M8, female, 4 poles, A-coded

Operating Range

n [rpm] 24-V-system



n [rpm] 48-V-system



Continuous operation
Short term operation

maxon Modular System Details on catalog page 32

maxon gear	Stages [opt.]	maxon brake
354_GPX 52 A/UP	1–3	522_AB 34
355_GPX 52 LN	1–3	

Configuration

Flange front: A-Flange/C-Flange
Interfaces: CANopen / EtherCAT

Precision planetary and spur gearheads

Explanations of maxon terminology gear and screw drive

Dimensional drawings
Presentation of the views according to the projection method E (ISO). All dimensions in [mm].

Mounting in plastic
Screwed connections on motors with plastic flanges require special attention.

M_A Max. tightening torque [Ncm]
A torque screwdriver may be adjusted to this value.

L Active thread depth [mm]
The relation of the thread depth to the thread diameter must be at least 2:1. The screw-in depth must be less than the usable length of the thread!

Gearhead data
Values are based on an ambient temperature of around 25°C (known as cold data).

Key Data (GPX)
Maximum values identified as key data represent the maximum for all stages/reductions.

Technical data

Max. continuous/intermittent* input speed
It is based on service life considerations. If this value is greatly exceeded, the service life can be shortened, the gear heats up more and more noise is generated.

Temperature range
The temperature range may be extended for some gears to –40°C and +100°C, but in extremely low temperatures, much greater power consumption must be expected. Special lubrication can be supplied on request, even for other temperature ranges.

Radial play
The radial play test value depends heavily on the mounting, measuring point and adjoining force. For this reason, the clearance of the measuring point to the flange is always given. Measurement is always carried out under a test force that is smaller than the maximum radial load.

Max. permissible radial load
Is stated in a specific distance from the gear flange. If it is not specified in stages, radial load is based on a reference speed of 1,000 rpm on the gear drive shaft.

Axial play
The value for the axial play of a gear is determined between the two axial end positions of the output shaft. This measurement is determined by the type of bearings and may be zero for preloaded ball bearings and low axial forces. Minimum play is required for any kind of friction bearings otherwise they will jam.

Max. axial load (dynamic)
Corresponds to the permissible axial load of the drive shaft without damaging the gear. Below the given load, axial play can be kept.

Max. permissible pressing force
Corresponds to the force with which, for example, a coupling element may be mounted to the gear drive shaft.

1 Reduction ratio
The reduction indicates the ratio by which the speed of the gear output shaft is smaller than the motor speed.

2 Absolute reduction ratio
Provides the reduction as an exact ratio of two natural numbers.

3 Max. motor shaft diameter [mm]
The max. motor shaft diameter is based on the motor pinion's internal diameter.

4 Number of stages
States the number of gear stages engaged in series.

5 Max. continuous torque [Nm]
The continuous torque provides the maximum load permanently applied to the output shaft. If it is exceeded, the service life is significantly shortened.

6 Intermittent* torque [Nm]
The intermittent torque is the value that may be applied to the gears for a short period without causing damage.

7 Efficiency [%]
The specified efficiency is a maximum value that is valid for maximum continuous torque. The efficiency is greatly reduced with very small loads (see diagram). The efficiency is stage-dependent, but is unaffected by the motor speed.

8 Weight [g]

9 Average backlash no load [°]
Gear backlash is the turning angle of the gear output shaft which, when the input shaft is blocked, the gear output shaft covers when it is turned from one end position to the opposite position. The end positions depend on the torque applied to the output shaft. It should be noted that if the gear output shaft is blocked, based on the reversed reduction ratio, the motor shaft will turn through a much greater angle from stop to stop.

10 Mass inertia [gcm²]
The gear moment of inertia is given at the motor shaft. It is required in order to calculate the additional torque needed for acceleration of the gear components in the case of highly dynamic drives. Variations may arise depending on how lubrication is distributed.

11 Gear length L1 [mm]
L1 describes the gear length down to the motor's axial mount area (reference C in motors).

12 Direction of rotation
The Direction of rotation of our planetary gears is always the same as that of the motor shaft. With spur gears, it depends on the number of stages. With even numbers (i.e. 2, 4, 6, 8), the Direction of rotation is the same, but the opposite if the numbers are odd.

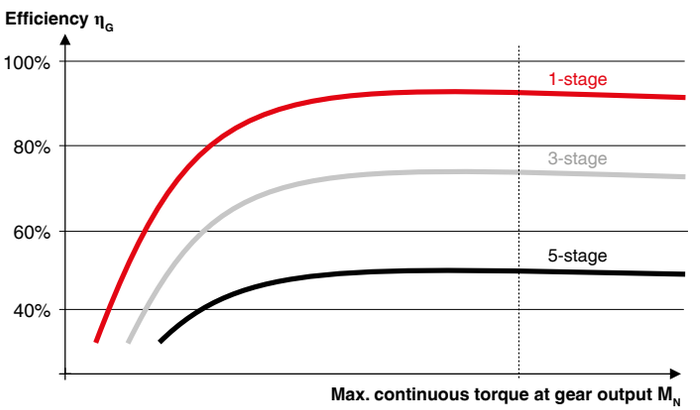
13 Max. transmittable power (continuous) [W]
This value gives the maximum constant output available on the output shaft. If it is exceeded, the service life is considerably shortened.

14 Max. transmittable power (intermittent*) [W]
This value gives the maximum intermittent output available on the output shaft. This range may be used intermittently and repeatedly.

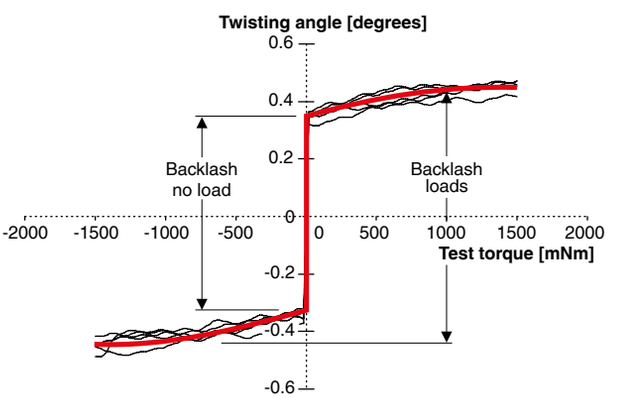
15 Max. overload torque
The maximal permitted torque that can be applied for a short period of time (a few seconds) without destroying the gear. It can be considered as break free torque, for example, to overcome static friction of a mechanically jammed drive.

***intermittent**
Short-term operation is defined as follows:
– during 1 second
– during max. 10 % of the operating cycle
If these values are exceeded, a reduced service life must be expected.

Gearhead efficiency as a function of torque (schematic)



Gear play measurement



maxon GPX

maxon GPX gearheads make an impression with the highest power transmission in a very short compact design. The modular construction and the scaled stages form the basis for a custom made drive solution. High torque, high speed, low noise, low backlash; maxon GPX gearheads fulfill practically all requirements. maxon GPX gearheads can be configured online and are ready for delivery within 11 working days.

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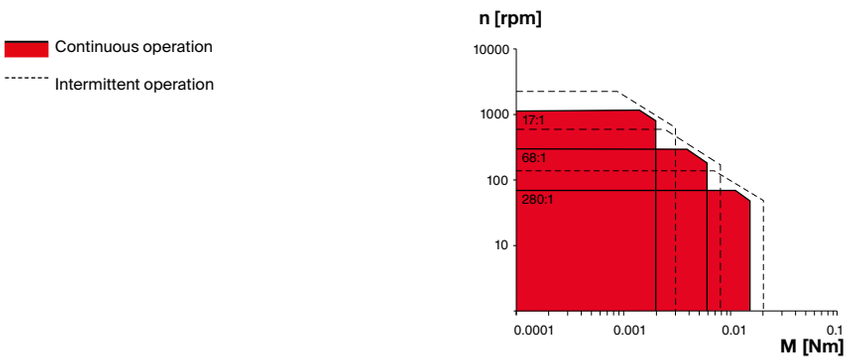
GPX 4
Planetary Gearhead ∅4 mm

NEW

GPX

Key Data		C Ceramic Version
Max. transmittable power	W	0.17
Max. continuous torque	Nm	0.015
Max. continuous input speed	rpm	20 000
Ambient temperature	°C	-15 ... +80
Bearing at output		Sleeve bearing

Operating Range (output shaft) — **C Ceramic Version**

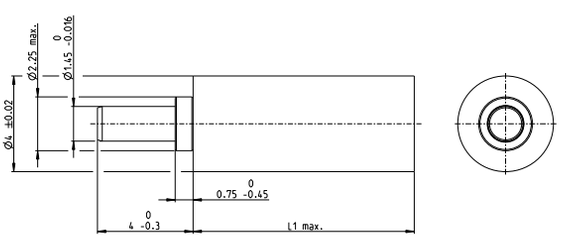


Specifications		C Ceramic Version		
Number of stages		2	3	4
Max. transmittable power (continuous)	W	0.17	0.12	0.08
Max. transmittable power (intermittent)	W	0.21	0.15	0.10
Max. continuous torque	Nm	0.002	0.006	0.015
Max. intermittent torque	Nm	0.003	0.008	0.020
Max. continuous input speed	rpm	20 000	20 000	20 000
Max. intermittent input speed	rpm	40 000	40 000	40 000
Max. efficiency	%	76	70	65
Average backlash no load	°	5	5	5
Max. axial load (dynamic)	N	5	5	5
Max. radial load, 4 mm from flange	N	3	4	4
Gearhead length L1[1]	mm	9.3	11.0	12.7
Weight	g	0.4	0.5	0.6

Configuration		C Ceramic Version		
Number of stages		2	3	4
Reduction Absolute reduction: (see online)	X:1	17	68	280
Version		Ceramic Version		
Flange		Standard flange		
Shaft		with/without flat face		

maxon Modular System		Page
maxon EC motor	№ of stages [opt.]	
ECX SPEED 4 M	2–4	171
ECX SPEED 4 L	2–4	172

Dimensions — **M 3:1**



[1]This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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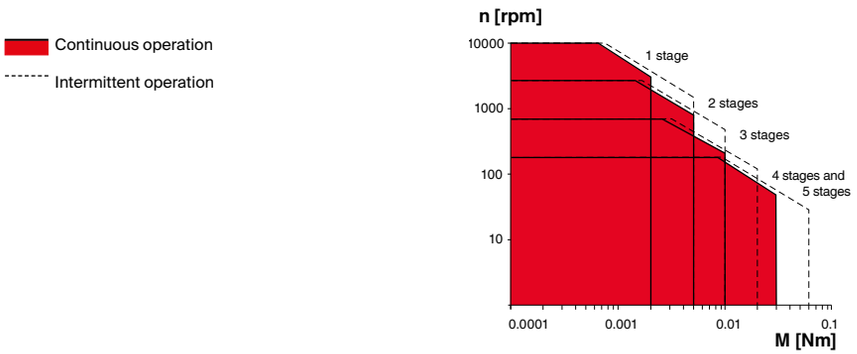
GPX 6
Planetary Gearhead ∅6 mm

Key Data		A Standard Version
Max. transmittable power	W	0.6
Max. continuous torque	Nm	0.03
Max. continuous input speed	rpm	16000
Ambient temperature	°C	-40 ... +100
Bearing at output		Ball bearing

Operating Range (output shaft) — A Standard Version

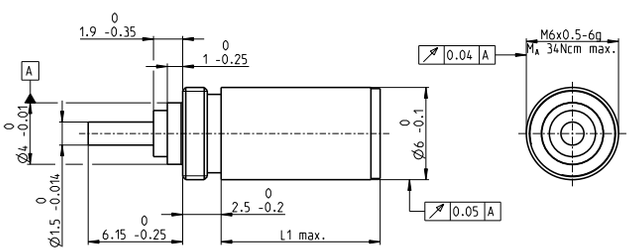


Specifications		A Standard Version				
Number of stages		1	2	3	4	5
Max. transmittable power (continuous)	W	0.63	0.39	0.20	0.15	0.04
Max. transmittable power (intermittent)	W	0.79	0.49	0.25	0.18	0.05
Max. continuous torque	Nm	0.002	0.005	0.01	0.03	0.03
Max. intermittent torque	Nm	0.005	0.01	0.02	0.06	0.06
Max. continuous input speed	rpm	40000	40000	40000	40000	40000
Max. intermittent input speed	rpm	40000	40000	40000	40000	40000
Max. efficiency	%	88	77	68	60	52
Average backlash no load	°	1.8	2.0	2.2	2.5	2.8
Max. axial load (dynamic)	N	5	5	5	5	5
Max. radial load, 5 mm from flange	N	5	6	7	8	8
Gearhead length L1[1]	mm	5.3	7.8	10.4	13.0	15.6
Weight	g	1.7	2.1	2.5	2.9	3.3

Configuration		A Standard Version				
Number of stages		1	2	3	4	5
Reduction Absolute reduction: (see online)	X:1	3.9	15	57	221	854
Version		Standard				
Flange		Standard flange/with central thread				
Shaft		Length/flat face				

maxon Modular System		Page
maxon DC motor	№ of stages [opt.]	
DCX 6 M	1–5	75
maxon EC motor		
ECX SPEED 6 M	1–5	173–174

Dimensions M 2:1



[1]This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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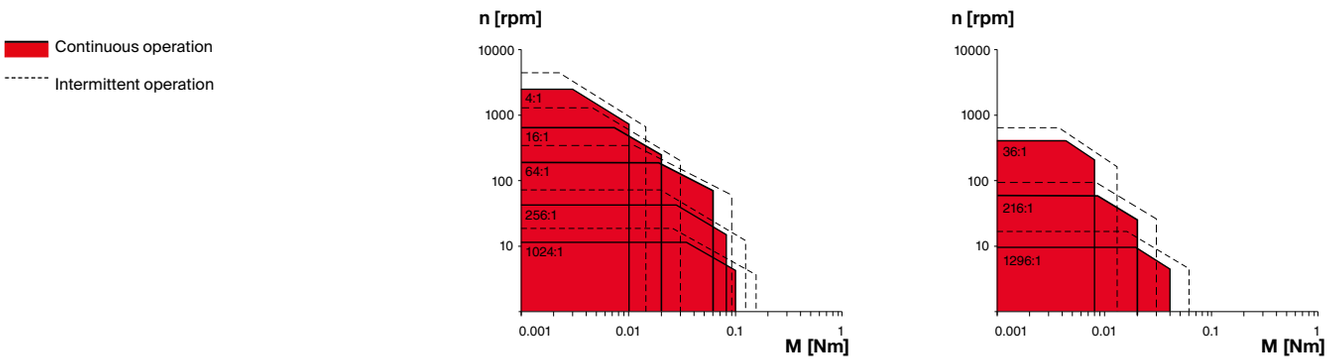
GPX 8
Planetary Gearhead ∅8 mm

Key Data		A Standard Version
Max. transmittable power	W	0.84
Max. continuous torque	Nm	0.1
Max. continuous input speed	rpm	12000
Ambient temperature	°C	-15 ... +80
Bearing at output		Ball bearing

Operating Range (output shaft) — **A Standard Version**

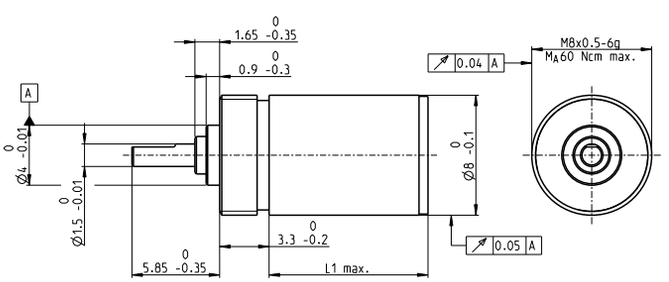


Specifications		A Standard Version							
Number of stages		1	2	2	3	3	4	4	5
Max. transmittable power (continuous)	W	0.840	0.520	0.140	0.390	0.060	0.130	0.040	0.040
Max. transmittable power (intermittent)	W	1.05	0.650	0.180	0.490	0.080	0.160	0.060	0.050
Max. continuous torque	Nm	0.010	0.020	0.008	0.060	0.020	0.080	0.040	0.100
Max. intermittent torque	Nm	0.015	0.030	0.012	0.090	0.030	0.120	0.060	0.150
Max. continuous input speed	rpm	12000	12000	12000	12000	12000	12000	12000	12000
Max. intermittent input speed	rpm	20000	20000	20000	20000	20000	20000	20000	20000
Max. efficiency	%	90	81	76	73	66	65	57	59
Average backlash no load	°	1.8	2.0	2.4	2.2	2.6	2.5	2.8	2.8
Max. axial load (dynamic)	N	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max. radial load, 5 mm from flange	N	5	6	6	7	7	8	8	8
Gearhead length L1[1]	mm	5.5	8.1	8.3	10.7	11.1	13.3	13.9	15.9
Weight	g	2.6	3.2	3.2	3.8	3.8	4.4	4.4	5.0

Configuration		A Standard Version							
Number of stages		1	2	2	3	3	4	4	5
Reduction Absolute reduction: (see online)	X:1	4	16	36	64	216	256	1296	1024
Version		Standard							
Flange		Standard flange/with central thread							
Shaft		Length/flat face							

maxon Modular System		Page
maxon DC motor	№ of stages [opt.]	
DCX 8 M	1–5	76
maxon EC motor		
ECX SPEED 8 M	1–5	175–176

Dimensions — **M 2:1**



[1]This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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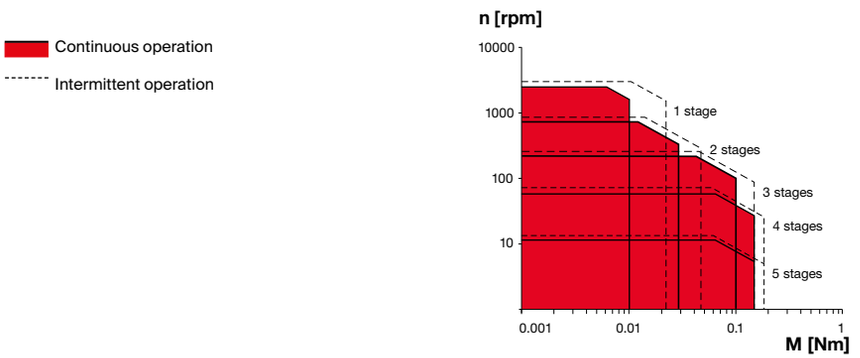
GPX 10
Planetary Gearhead ∅10 mm

Key Data		A Standard Version
Max. transmittable power	W	1.6
Max. continuous torque	Nm	0.15
Max. continuous input speed	rpm	12000
Ambient temperature	°C	-40 ... +80
Bearing at output		Ball bearing

Operating Range (output shaft) — **A Standard Version**

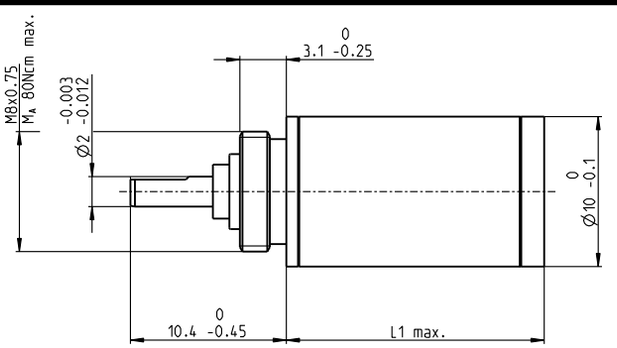


Specifications		A Standard Version				
Number of stages		1	2	3	4	5
Max. transmittable power (continuous)	W	1.6	1.2	1.0	0.40	0.10
Max. transmittable power (intermittent)	W	2.0	1.5	1.3	0.50	0.13
Max. continuous torque	Nm	0.01	0.03	0.10	0.15	0.15
Max. intermittent torque	Nm	0.02	0.05	0.15	0.20	0.20
Max. continuous input speed	rpm	12000	12000	12000	12000	12000
Max. intermittent input speed	rpm	15000	15000	15000	15000	15000
Max. efficiency	%	90	81	73	65	59
Average backlash no load	°	1.5	1.8	2.0	2.2	2.5
Max. axial load (dynamic)	N	5	5	5	5	5
Max. radial load, 5 mm from flange	N	5	10	15	20	25
Gearhead length L1[1]	mm	9.9	13.4	16.6	19.8	23.0
Weight	g	6.7	7.2	7.7	8.2	8.7

Configuration		A Standard Version				
Number of stages		1	2	3	4	5
Reduction	X:1	4	16	64	256	1024
Absolute reduction: (see online)						
Version		Standard				
Flange		Standard flange				
Shaft		Length/flat face				

maxon Modular System		Page
maxon DC motor	№ of stages [opt.]	
DCX 10 S	1–5	77
DCX 10 L	1–5	78

Dimensions — **M 2:1**



[1]This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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GPX 12
Planetary Gearhead ∅12 mm

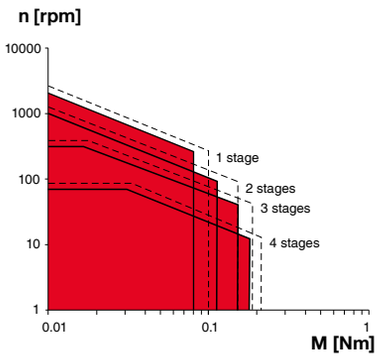
Key Data		A Standard Version	C Ceramic Version
Max. transmittable power	W	2	2.4
Max. continuous torque	Nm	0.17	0.23
Max. continuous input speed	rpm	16 000	16 000
Ambient temperature	°C	-40 ... +100	-40 ... +100
Bearing at output		Ball bearing	Ball bearing

Operating Range (output shaft)

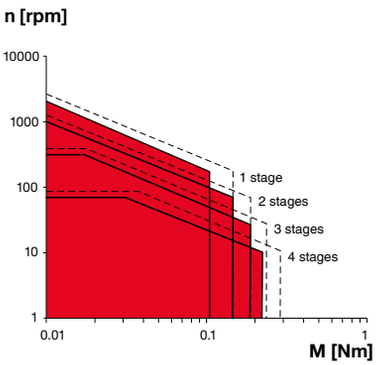
Continuous operation

Intermittent operation

A Standard Version



C Ceramic Version

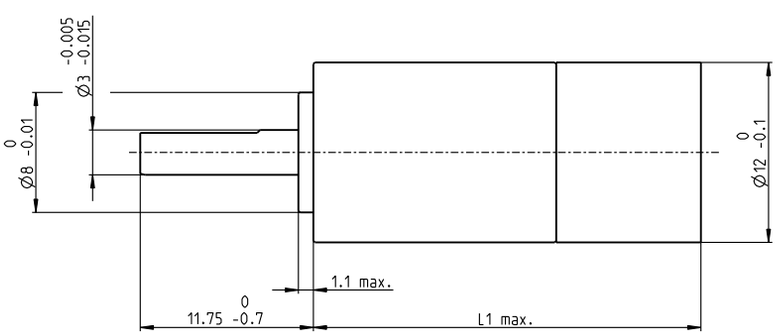


Specifications		A Standard Version				C Ceramic Version			
Number of stages		1	2	3	4	1	2	3	4
Max. transmittable continuous power	W	2.0	1.0	0.50	0.25	2.4	1.2	0.60	0.30
Max. transmittable intermittent power	W	2.5	1.25	0.65	0.30	3.0	1.50	0.80	0.40
Max. continuous torque	Nm	0.08	0.11	0.14	0.17	0.11	0.15	0.19	0.23
Max. intermittent torque	Nm	0.10	0.14	0.18	0.21	0.15	0.19	0.24	0.29
Max. continuous input speed	rpm	16000	16000	16000	16000	16000	16000	16000	16000
Max. intermittent input speed	rpm	20000	20000	20000	20000	20000	20000	20000	20000
Max. efficiency	%	90	80	75	65	90	80	75	65
Average backlash no load	°	1.2	1.5	1.8	2.1	1.2	1.5	1.8	2.1
Max. axial load (dynamic)	N	20	20	20	20	20	20	20	20
Max. radial load, 5 mm from flange	N	30	35	50	50	30	35	50	50
Gearhead length L1[1]	mm	15.5	20.4	25.2	30.1	15.5	20.4	25.2	30.1
Weight	g	11	14	17	19	11	14	17	19

Configuration		A Standard Version				C Ceramic Version			
Number of stages		1	2	3	4	1	2	3	4
Reduction Absolute reduction: (see online)	X:1	3.9, 5.3	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526	3.9, 5.3	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526
Version		Standard/ceramic version/noise reduced/reduced backlash/high power							
Flange		Standard flange/configurable flange							
Shaft		Length/flat face							

maxon Modular System		Page
maxon DC motor	№ of stages [opt.]	
DCX 12 S	1–4	79
DCX 12 L	1–4	80

Dimensions M 2:1



[1]This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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GPX 12
Planetary Gearhead ∅12 mm

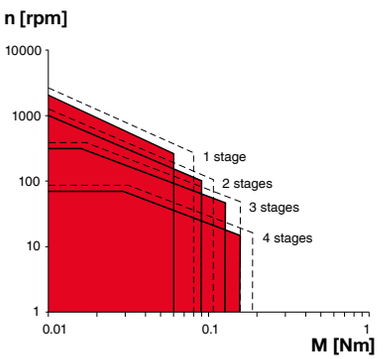
Key Data		LN Noise Reduced	LZ Backlash Reduced
Max. transmittable power	W	1.6	1
Max. continuous torque	Nm	0.14	0.2
Max. continuous input speed	rpm	16 000	16 000
Ambient temperature	°C	-40 ... +85	-40 ... +100
Bearing at output		Ball bearing	Ball bearing
Typical noise level	dBA	-5 dBA compared to standard configuration	

Operating Range (output shaft)

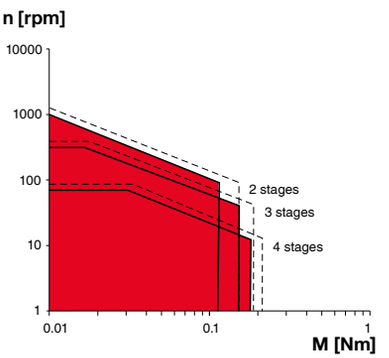
Continuous operation

Intermittent operation

LN Noise Reduced



LZ Backlash Reduced

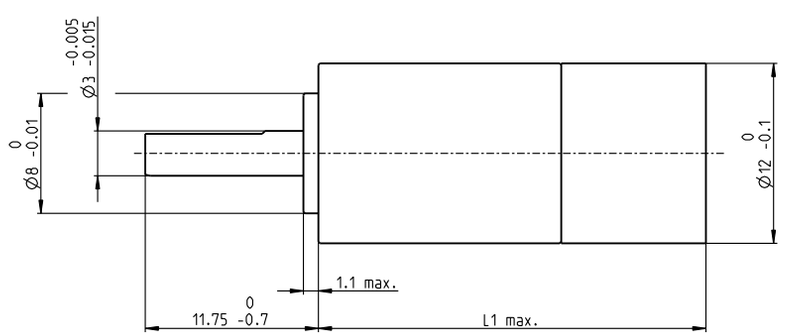


Specifications		LN Noise Reduced				LZ Backlash Reduced		
Number of stages		1	2	3	4	2	3	4
Max. transmittable continuous power	W	1.6	0.8	0.40	0.20	1.0	0.50	0.25
Max. transmittable intermittent power	W	2.0	1.00	0.50	0.25	1.25	0.65	0.30
Max. continuous torque	Nm	0.06	0.09	0.11	0.14	0.11	0.14	0.17
Max. intermittent torque	Nm	0.08	0.11	0.14	0.18	0.14	0.18	0.21
Max. continuous input speed	rpm	16000	16000	16000	16000	16000	16000	16000
Max. intermittent input speed	rpm	20000	20000	20000	20000	20000	20000	20000
Max. efficiency	%	90	80	75	65	80	75	65
Average backlash no load	°	1.2	1.5	1.8	2.1	1.35	1.6	1.8
Max. axial load (dynamic)	N	20	20	20	20	20	20	20
Max. radial load, 5 mm from flange	N	30	35	50	50	35	50	50
Gearhead length L1[1]	mm	15.5	20.4	25.2	30.1	20.4	25.2	30.1
Weight	g	11	14	17	19	14	17	19

Configuration		LN Noise Reduced				LZ Backlash Reduced		
Number of stages		1	2	3	4	2	3	4
Reduction Absolute reduction: (see online)	X:1	3.9, 5.3	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526
Version		Standard/ceramic version/noise reduced/backlash reduced/high power						
Flange		Standard flange/configurable flange						
Shaft		Length/flat face						

maxon Modular System		Page
maxon DC motor	№ of stages [opt.]	
DCX 12 S	1–4	79
DCX 12 L	1–4	80

Dimensions M 2:1



[1]This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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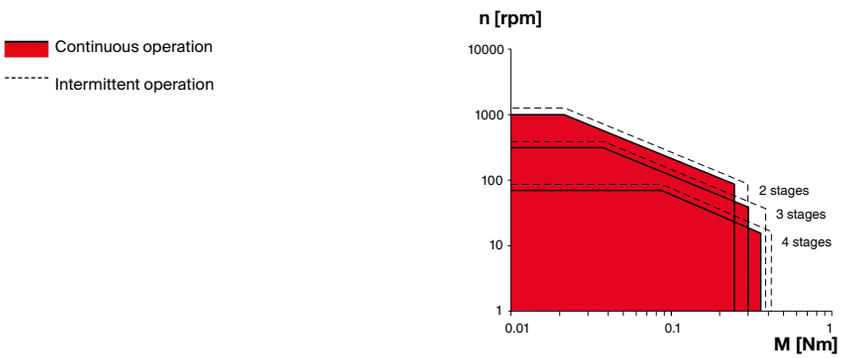
GPX 12
Planetary Gearhead ∅12 mm

GPX

Key Data		HP High Power
Max. transmittable power	W	2.2
Max. continuous torque	Nm	0.35
Max. continuous input speed	rpm	16 000
Ambient temperature	°C	-40 ... +100
Bearing at output		Ball bearing

Operating Range (output shaft) — HP High Power

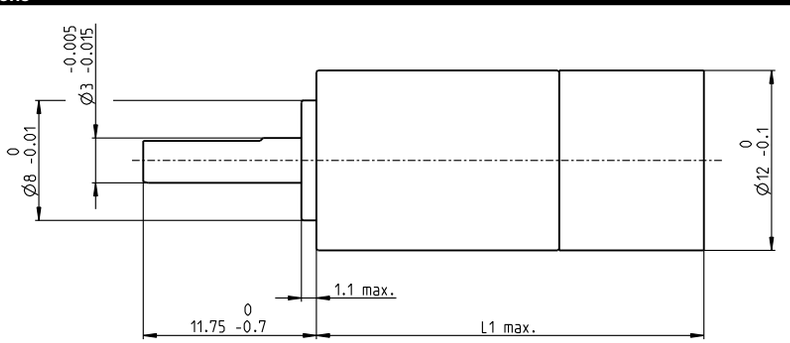


Specifications		HP High Power		
Number of stages		2	3	4
Max. transmittable power (continuous)	W	2.2	1.10	0.60
Max. transmittable power (intermittent)	W	2.80	1.40	0.80
Max. continuous torque	Nm	0.25	0.30	0.35
Max. intermittent torque	Nm	0.30	0.38	0.41
Max. continuous input speed	rpm	16000	16000	16000
Max. intermittent input speed	rpm	20000	20000	20000
Max. efficiency	%	75	65	55
Average backlash no load	°	1.5	1.8	2.1
Max. axial load (dynamic)	N	20	20	20
Max. radial load, 5 mm from flange	N	45	60	60
Gearhead length L1[1]	mm	23.4	28.1	33.1
Weight	g	16	19	21

Configuration		HP High Power		
Number of stages		2	3	4
Reduction Absolute reduction: (see online)	X:1	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526
Version		Standard/ceramic version/noise reduced/backlash reduced/high power		
Flange		Standard flange		
Shaft		Length/flat face		

maxon Modular System		Page
maxon DC motor	№ of stages [opt.]	
DCX 12 S	2–4	79
DCX 12 L	2–4	80

Dimensions — M 2:1



[1]This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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GPX 13 SPEED
Planetary Gearhead ∅13 mm
Sterilizable

GPX

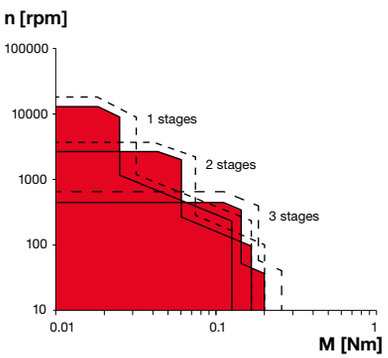
Key Data		Without shaft seal*	With shaft seal*
Max. transmittable power	W	22 (3.2)	22 (3.2)
Max. continuous torque	Nm	0.15	0.15
Max. continuous input speed	rpm	60 000	60 000
Ambient temperature	°C	-10 ... +135	-10 ... +135
Bearing at output		Ball bearing	Ball bearing

Operating Range (output shaft)

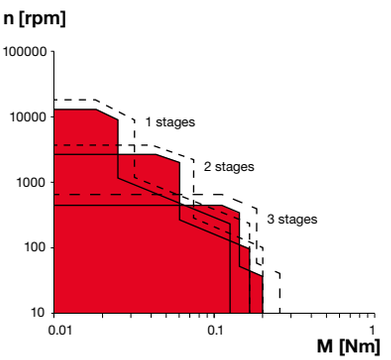
Continuous operation

Intermittent operation

Without shaft seal



With shaft seal



Sterilization information

Without shaft seal: typically 1000 autoclave cycles
With shaft seal: typically 2000 autoclave cycles

Sterilization with steam

Temperature	134°C ± 4°C
Compression pressure up to	2.3 bar
Rel. humidity	100%
Cycle length	18 minutes

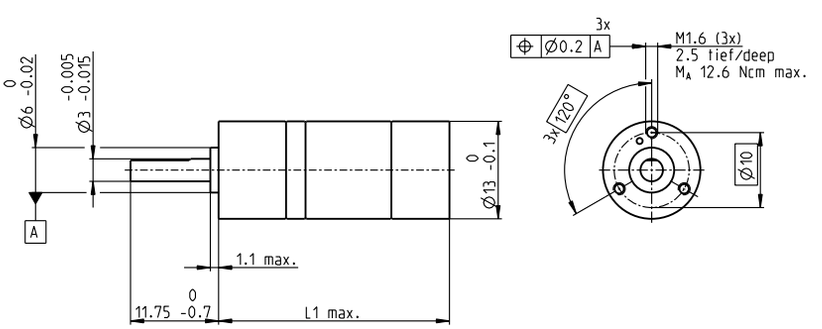
135°C

Specifications		Without shaft seal*			With shaft seal*		
Number of stages		1	2	3	1	2	3
Max. transmittable continuous power	W	22 (3.2)	11 (1.6)	6 (0.8)	22 (3.2)	11 (1.6)	6 (0.8)
Max. transmittable intermittent power	W	27 (4)	13 (2)	7 (1)	27 (4)	13 (2)	7 (1)
Max. continuous torque	Nm	0.025 (0.13)	0.06 (0.16)	0.15 (0.2)	0.025 (0.13)	0.06 (0.16)	0.15 (0.2)
Max. intermittent torque	Nm	0.030 (0.16)	0,075 (0.2)	0.19 (0.25)	0.030 (0.16)	0.075 (0.2)	0.19 (0.25)
Max. continuous input speed	rpm	60000	60000	60000	60000	60000	60000
Max. intermittent input speed	rpm	75000	75000	75000	75000	75000	75000
Max. efficiency	%	85	80	70	85	80	70
Average backlash no load	°	1.2	1.4	1.6	1.2	1.4	1.6
Max. axial load (dynamic)	N	20	20	20	20	20	20
Max. radial load, 5 mm from flange	N	10	15	25	10	15	25
Gearhead length L1[1]	mm	30.8	36.6	42.4	30.8	36.6	42.4
Weight	g	21	26	30	21	26	30

Configuration		Without shaft seal			With shaft seal		
Number of stages		1	2	3	1	2	3
Reduction Absolute reduction: (see online)	X:1	5	25	125	5	25	125
Version		Without shaft seal/With shaft seal					
Flange		Standard flange/configurable flange					
Shaft		Length/flat face					

maxon Modular System		Page
maxon EC motor	№ of stages [opt.]	
ECX SPEED 13 M	1–3	177–180
ECX SPEED 13 L	1–3	181–184

Dimensions M 1:1



[1]This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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*Values in parentheses apply in case of reduced speed (according to diagram).

GPX 14
Planetary Gearhead ∅14 mm

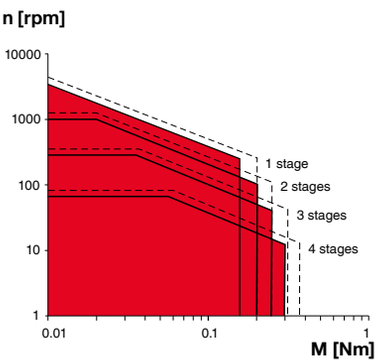
Key Data		A Standard Version	C Ceramic Version
Max. transmittable power	W	4	4.8
Max. continuous torque	Nm	0.3	0.4
Max. continuous input speed	rpm	16 000	16 000
Ambient temperature	°C	-40 ... +100	-40 ... +100
Bearing at output		Ball bearing	Ball bearing

Operating Range (output shaft)

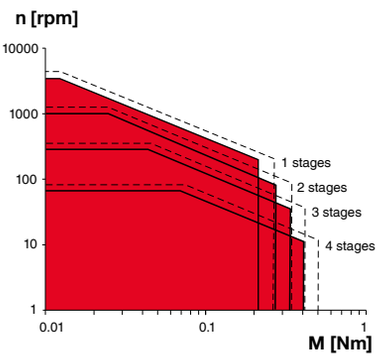
Continuous operation

Intermittent operation

A Standard Version



C Ceramic Version

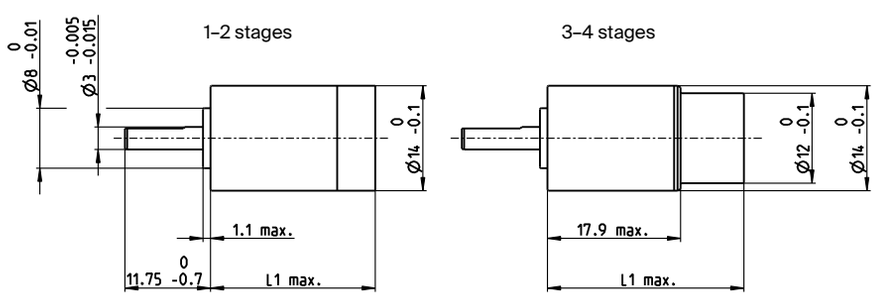


Specifications		A Standard Version				C Ceramic Version			
Number of stages		1	2	3	4	1	2	3	4
Max. transmittable continuous power	W	4.0	2.0	1.0	0.4	4.8	2.4	1.2	0.5
Max. transmittable intermittent power	W	5.0	2.5	1.25	0.5	6.0	3.0	1.50	0.6
Max. continuous torque	Nm	0.16	0.20	0.25	0.30	0.21	0.27	0.33	0.40
Max. intermittent torque	Nm	0.20	0.25	0.31	0.38	0.26	0.34	0.41	0.50
Max. continuous input speed	rpm	14000	16000	16000	16000	14000	16000	16000	16000
Max. intermittent input speed	rpm	17500	20000	20000	20000	17500	20000	20000	20000
Max. efficiency	%	90	80	75	65	90	80	75	65
Average backlash no load	°	1.1	1.3	1.45	1.7	1.1	1.3	1.45	1.7
Max. axial load (dynamic)	N	20	20	20	20	20	20	20	20
Max. radial load, 5 mm from flange	N	30	45	60	60	30	45	60	60
Gearhead length L1[1]	mm	15.7	20.8	25.5	30.3	15.7	20.8	25.5	30.3
Weight	g	14	19	21	23	14	19	21	23

Configuration		A Standard Version				C Ceramic Version			
Number of stages		1	2	3	4	1	2	3	4
Reduction Absolute reduction: (see online)	X:1	3.9, 5.3, 6.6	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526	3.9, 5.3, 6.6	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526
Version		Standard/ceramic version/noise reduced/backlash reduced/high power							
Flange		Standard flange/configurable flange							
Shaft		Length/flat face							

maxon Modular System		Page
maxon DC motor	№ of stages [opt.]	
DCX 12 S	3–4	79
DCX 12 L	3–4	80
DCX 14 L	1–2 [3–4]	81–82
maxon EC motor	№ of stages [opt.]	
ECX SPEED 13 M	1–2 [3–4]	177–180
ECX SPEED 13 L	1–2 [3–4]	181–184

Dimensions M 1:1



[1]This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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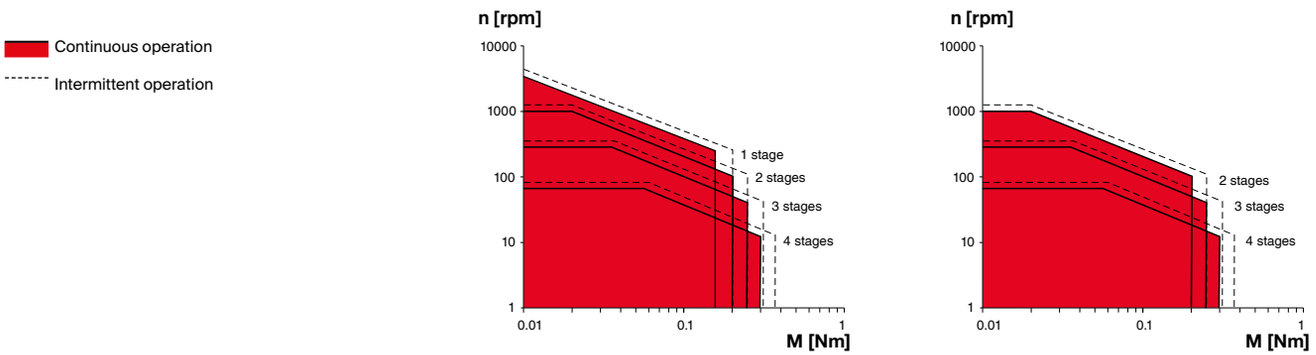
GPX 14
Planetary Gearhead ∅14 mm

Key Data		LN Noise Reduced	LZ Backlash Reduced
Max. transmittable power	W	3.2	3
Max. continuous torque	Nm	0.24	0.3
Max. continuous input speed	rpm	16000	16000
Ambient temperature	°C	-40 ... +85	-40 ... +100
Bearing at output		Ball bearing	Ball bearing
Typical noise level	dBA	-5 dBA compared to standard configuration	

Operating Range (output shaft) — LN Noise Reduced — LZ Backlash Reduced

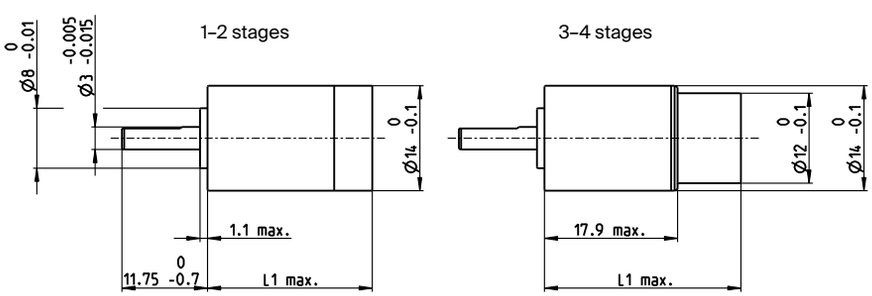


Specifications		LN Noise Reduced				LZ Backlash Reduced			
Number of stages		1	2	3	4	2	3	4	
Max. transmittable continuous power	W	3.2	1.6	0.8	0.3	2.0	1.0	0.4	
Max. transmittable intermittent power	W	4.0	2.0	1.0	0.4	2.5	1.25	0.5	
Max. continuous torque	Nm	0.13	0.16	0.20	0.24	0.20	0.25	0.30	
Max. intermittent torque	Nm	0.16	0.20	0.25	0.30	0.25	0.31	0.38	
Max. continuous input speed	rpm	14000	16000	16000	16000	16000	16000	16000	
Max. intermittent input speed	rpm	17500	20000	20000	20000	20000	20000	20000	
Max. efficiency	%	90	80	75	65	80	75	65	
Average backlash no load	°	1.1	1.3	1.45	1.7	0.95	1.05	1.2	
Max. axial load (dynamic)	N	20	20	20	20	20	20	20	
Max. radial load, 5 mm from flange	N	30	45	60	60	45	60	60	
Gearhead length L1[1]	mm	15.7	20.8	25.5	30.3	20.8	25.5	30.3	
Weight	g	14	19	21	23	19	21	23	

Configuration		LN Noise Reduced				LZ Backlash Reduced			
Number of stages		1	2	3	4	2	3	4	
Reduction Absolute reduction: (see online)	X:1	3.9, 5.3, 6.6	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526	
Version		Standard/ceramic version/noise reduced/backlash reduced/high power							
Flange		Standard flange/configurable flange							
Shaft		Length/flat face							

maxon Modular System		Page
maxon DC motor	№ of stages [opt.]	
DCX 12 S	3–4	79
DCX 12 L	3–4	80
DCX 14 L	1–2 [3–4]	81–82
maxon EC motor	№ of stages [opt.]	
ECX SPEED 13 M	1–2 [3–4]	177–180
ECX SPEED 13 L	1–2 [3–4]	181–184

Dimensions M 1:1



[1]This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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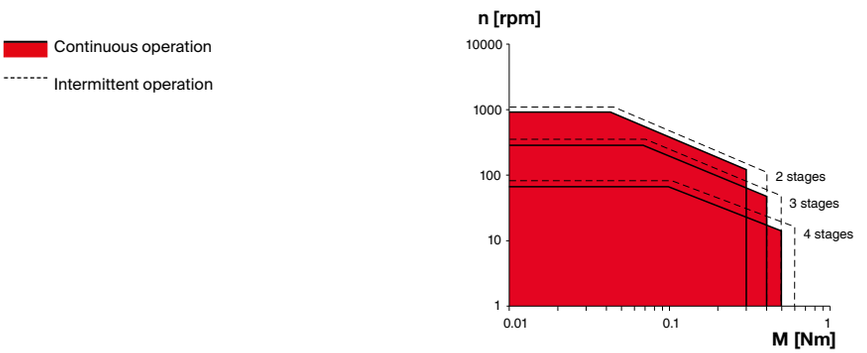
GPX 14
Planetary Gearhead ∅14 mm

Key Data		HP High Power
Max. transmittable power	W	4.0
Max. continuous torque	Nm	0.50
Max. continuous input speed	rpm	16 000
Ambient temperature	°C	-40 ... +100
Bearing at output		Ball bearing

Operating Range (output shaft) — HP High Power

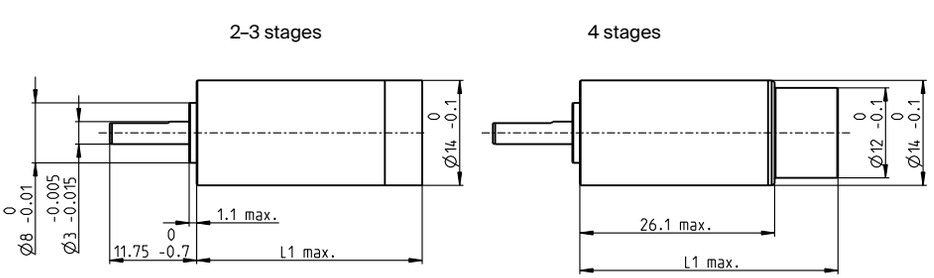


Specifications		HP High Power		
Number of stages		2	3	4
Max. transmittable power (continuous)	W	4.0	2.0	0.7
Max. transmittable power (intermittent)	W	5.0	2.5	1.0
Max. continuous torque	Nm	0.30	0.40	0.50
Max. intermittent torque	Nm	0.40	0.50	0.60
Max. continuous input speed	rpm	14000	16000	16000
Max. intermittent input speed	rpm	17500	20000	20000
Max. efficiency	%	75	65	55
Average backlash no load	°	1.3	1.45	1.7
Max. axial load (dynamic)	N	20	20	20
Max. radial load, 5 mm from flange	N	45	70	70
Gearhead length L1[1]	mm	23.9	29.0	33.7
Weight	g	21	25	27

Configuration		HP High Power		
Number of stages		2	3	4
Reduction Absolute reduction: (see online)	X:1	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526
Version		Standard/ceramic version/noise reduced/backlash reduced/high power		
Flange		Standard flange		
Shaft		Length/flat face		

maxon Modular System		Page
maxon DC motor	**№ of stages [opt.]**	
DCX 12 S	4	79
DCX 12 L	4	80
DCX 14 L	2–3 [4]	81–82
maxon EC motor	**№ of stages [opt.]**	
ECX SPEED 13 M	2–3 [4]	177–180
ECX SPEED 13 L	2–3 [4]	181–184

Dimensions M 1:1



[1]This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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GPX 16
Planetary Gearhead ∅16 mm

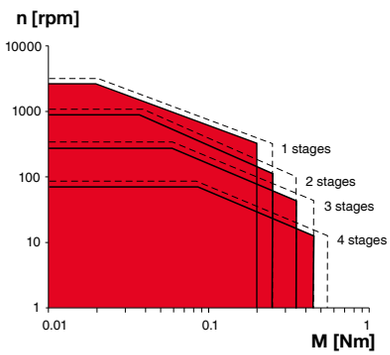
Key Data		A Standard Version	C Ceramic Version
Max. transmittable power	W	6.5	7.8
Max. continuous torque	Nm	0.45	0.6
Max. continuous input speed	rpm	16000	16000
Ambient temperature	°C	-40 ... +100	-40 ... +100
Bearing at output		Ball bearing	Ball bearing

Operating Range (output shaft)

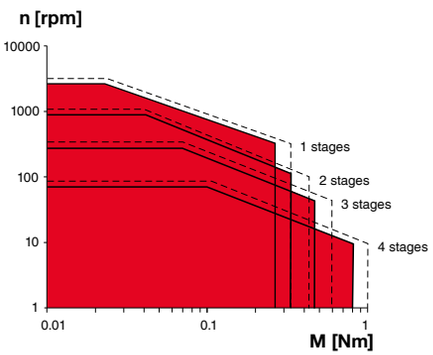
Continuous operation

Intermittent operation

A Standard Version



C Ceramic Version



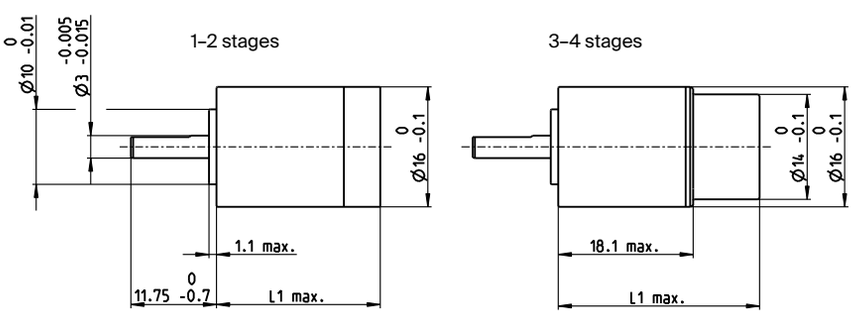
Specifications		A Standard Version				C Ceramic Version			
Number of stages		1	2	3	4	1	2	3	4
Max. transmittable continuous power	W	6.5	3.2	1.6	0.60	7.8	3.8	1.9	0.7
Max. transmittable intermittent power	W	8.0	4.0	2.0	0.75	10.0	5.0	2.5	1.0
Max. continuous torque	Nm	0.20	0.25	0.35	0.45	0.27	0.33	0.47	0.60
Max. intermittent torque	Nm	0.25	0.35	0.45	0.55	0.33	0.42	0.58	0.75
Max. continuous input speed	rpm	12000	14000	16000	16000	12000	14000	16000	16000
Max. intermittent input speed	rpm	15000	17500	20000	20000	15000	17500	20000	20000
Max. efficiency	%	90	80	75	65	90	80	75	65
Average backlash no load	°	1.0	1.2	1.3	1.4	1.0	1.2	1.3	1.4
Max. axial load (dynamic)	N	20	20	20	20	20	20	20	20
Max. radial load, 5 mm from flange	N	30	45	70	70	30	45	70	70
Gearhead length L1[1]	mm	15.8	20.7	25.7	30.6	15.8	20.7	25.7	30.6
Weight	g	20	25	27	31	20	25	27	31

Configuration		A Standard Version				C Ceramic Version			
Number of stages		1	2	3	4	1	2	3	4
Reduction Absolute reduction: (see online)	X:1	3.9, 5.3, 6.6	16, 21, 26, 28, 35, 44	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526	3.9, 5.3, 6.6	16, 21, 26, 28, 35, 44	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526
Version		Standard/ceramic version/noise reduced/reduced backlash/high power							
Flange		Standard flange/configurable flange							
Shaft		Length/flat face							

maxon Modular System		Page
maxon DC motor	№ of stages [opt.]	
DCX 14 L	3–4	81–82
DCX 16 S	1–2 [3–4]	83–84
DCX 16 L	1–2 [3–4]	85–86
DC-max 16 S*	1–2 [3–4]	99–100
maxon EC motor	№ of stages [opt.]	
ECX SPEED 13 M	3–4	177–180
ECX SPEED 13 L	3–4	181–184
ECX SPEED 16 M	1–2 [3–4]	185–188
ECX SPEED 16 L	1–2 [3–4]	189–192

*Limited selection of reduction ratios (see online).

Dimensions M 1:1



[1]This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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GPX 16
Planetary Gearhead ∅16 mm

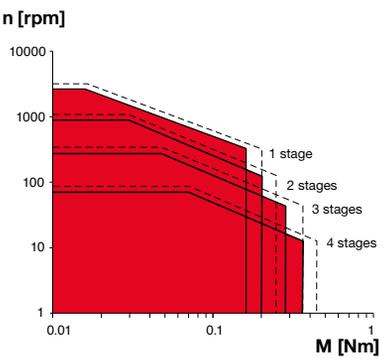
Key Data		LN Noise Reduced	LZ Backlash Reduced
Max. transmittable power	W	5.2	3.2
Max. continuous torque	Nm	0.36	0.5
Max. continuous input speed	rpm	16 000	16 000
Ambient temperature	°C	-40 ... +85	-40 ... +100
Bearing at output		Ball bearing	Ball bearing
Typical noise level	dBA	-5 dBA compared to standard configuration	

Operating Range (output shaft)

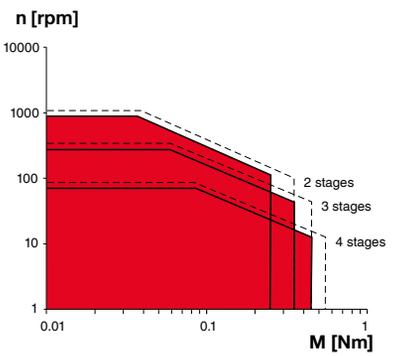
Continuous operation

Intermittent operation

LN Noise Reduced



LZ Backlash Reduced



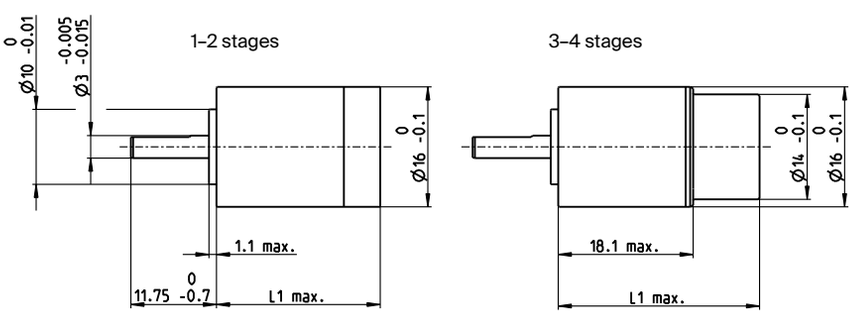
Specifications		LN Noise Reduced				LZ Backlash Reduced		
Number of stages		1	2	3	4	2	3	4
Max. transmittable continuous power	W	5.2	2.6	1.3	0.5	3.2	1.6	0.6
Max. transmittable intermittent power	W	6.5	3.3	1.6	0.6	4.0	2.0	0.8
Max. continuous torque	Nm	0.16	0.20	0.28	0.36	0.25	0.35	0.45
Max. intermittent torque	Nm	0.20	0.25	0.35	0.45	0.35	0.45	0.55
Max. continuous input speed	rpm	12000	14000	16000	16000	14000	16000	16000
Max. intermittent input speed	rpm	15000	17500	20000	20000	17500	20000	20000
Max. efficiency	%	90	80	75	65	80	75	65
Average backlash no load	°	1.0	1.2	1.3	1.4	0.8	0.9	1.0
Max. axial load (dynamic)	N	20	20	20	20	20	20	20
Max. radial load, 5 mm from flange	N	30	45	70	70	45	70	70
Gearhead length L1[1]	mm	15.8	20.7	25.7	30.6	20.7	25.7	30.6
Weight	g	20	25	27	30.6	25	27	30.6

Configuration		LN Noise Reduced				LZ Backlash Reduced		
Number of stages		1	2	3	4	2	3	4
Reduction Absolute reduction: (see online)	X:1	3.9, 5.3, 6.6	16, 21, 26, 28, 35, 44	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526	16, 21, 26, 28, 35, 44	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526
Version		Standard/ceramic version/noise reduced/backlash reduced/high power						
Flange		Standard flange/configurable flange						
Shaft		Length/flat face						

maxon Modular System		Page
maxon DC motor	№ of stages [opt.]	
DCX 14 L	3–4	81–82
DCX 16 S	1–2 [3–4]	83–84
DCX 16 L	1–2 [3–4]	85–86
DC-max 16 S*	1–2 [3–4]	99–100
maxon EC motor	№ of stages [opt.]	
ECX SPEED 13 M	3–4	177–180
ECX SPEED 13 L	3–4	181–184
ECX SPEED 16 M	1–2 [3–4]	185–188
ECX SPEED 16 L	1–2 [3–4]	189–192

*Limited selection of reduction ratios (see online).

Dimensions M 1:1



[1]This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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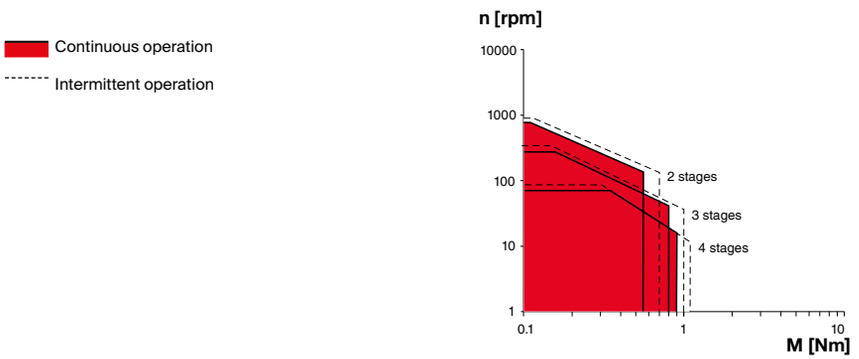
GPX 16
Planetary Gearhead ∅16 mm

Key Data		HP High Power
Max. transmittable power	W	8
Max. continuous torque	Nm	0.9
Max. continuous input speed	rpm	16000
Ambient temperature	°C	-40 ... +100
Bearing at output		Ball bearing

Operating Range (output shaft) — HP High Power

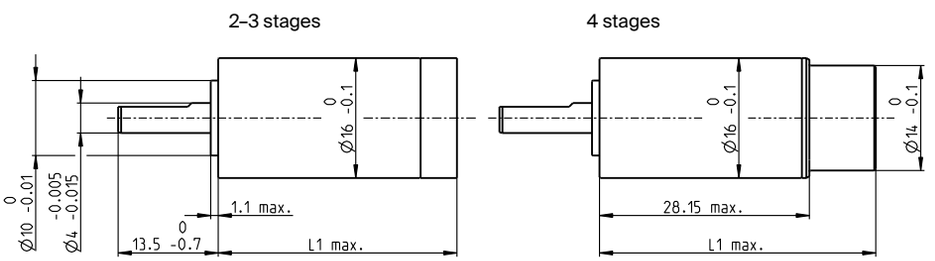


Specifications		HP High Power		
Number of stages		2	3	4
Max. transmittable power (continuous)	W	8.0	4.0	1.5
Max. transmittable power (intermittent)	W	10.0	4.4	1.5
Max. continuous torque	Nm	0.55	0.80	0.90
Max. intermittent torque	Nm	0.70	1.00	1.10
Max. continuous input speed	rpm	12000	14000	16000
Max. intermittent input speed	rpm	15000	17500	20000
Max. efficiency	%	75	65	55
Average backlash no load	°	1.2	1.3	1.4
Max. axial load (dynamic)	N	30	30	30
Max. radial load, 5 mm from flange	N	80	90	90
Gearhead length L1[1]	mm	25.9	30.9	35.7
Weight	g	31	35	39

Configuration		HP High Power		
Number of stages		2	3	4
Reduction Absolute reduction: (see online)	X:1	16, 21, 26, 28, 35, 44	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526
Version		Standard/ceramic version/noise reduced/backlash reduced/high power		
Flange		Standard flange		
Shaft		Length/flat face/cross hole		

maxon Modular System		Page
maxon DC motor	№ of stages [opt.]	
DCX 14 L	4	81–82
DCX 16 S	2–3 [4]	83–84
DCX 16 L	2–3 [4]	85–86
maxon EC motor	№ of stages [opt.]	
ECX SPEED 13 M	4	177–180
ECX SPEED 13 L	4	181–184
ECX SPEED 16 M	2–3 [4]	185–188
ECX SPEED 16 L	2–3 [4]	189–192

Dimensions M 1:1



[1]This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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GPX 16 SPEED

Planetary Gearhead ∅16 mm

Sterilizable

GPX

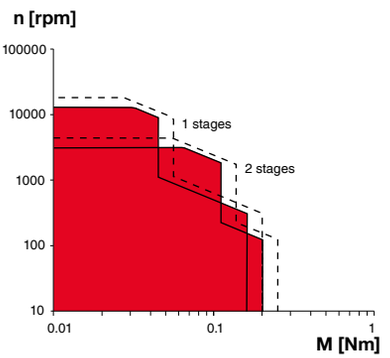
Key Data		Without shaft seal*	With shaft seal*
Max. transmittable power	W	42 (5.2)	42 (5.2)
Max. continuous torque	Nm	0.11 (0.2)	0.11 (0.2)
Max. continuous input speed	rpm	50 000	50 000
Ambient temperature	°C	-10 ... +135	-10 ... +135
Bearing at output		Ball bearing	Ball bearing

Operating Range (output shaft)

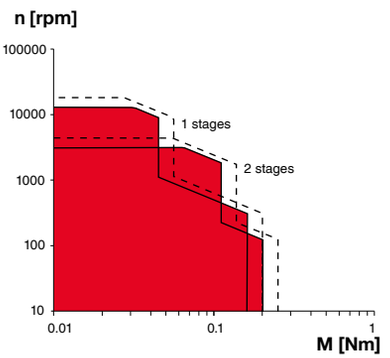
Continuous operation

Intermittent operation

Without shaft seal



With shaft seal



Sterilization information

Without shaft seal: typically 1000 autoclave cycles
With shaft seal: typically 2000 autoclave cycles

Sterilization with steam

Temperature	134°C ± 4°C
Compression pressure up to	2.3 bar
Rel. humidity	100%
Cycle length	18 minutes

135°C

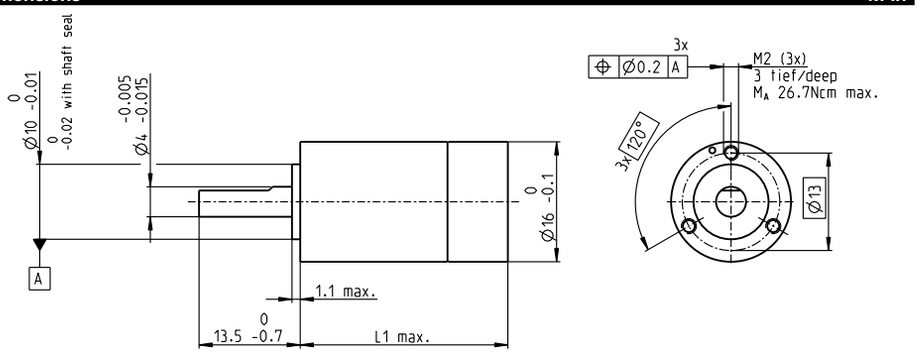
Specifications		Without shaft seal*		With shaft seal*	
Number of stages		1	2	1	2
Max. transmittable continuous power	W	42 (5.2)	21 (2.6)	42 (5.2)	21 (2.6)
Max. transmittable intermittent power	W	52 (6.5)	25 (3.3)	52 (6.5)	25 (3.3)
Max. continuous torque	Nm	0.045 (0.16)	0.11 (0.20)	0.045 (0.16)	0.11 (0.20)
Max. intermittent torque	Nm	0.055 (0.20)	0.140 (0.25)	0.055 (0.20)	0.140 (0.25)
Max. continuous input speed	rpm	50000	50000	50000	50000
Max. intermittent input speed	rpm	70000	70000	70000	70000
Max. efficiency	%	85	80	85	80
Average backlash no load	°	1.4	1.6	1.4	1.6
Max. axial load (dynamic)	N	30.0	30.0	30.0	30.0
Max. radial load, 5 mm from flange	N	25.0	35.0	15.0	20.0
Gearhead length L1[1]	mm	27.7	35.1	35.3	42.7
Weight	g	27	35	37	45

Configuration		Without shaft seal		With shaft seal	
Number of stages		1	2	1	2
Reduction Absolute reduction: (see online)	X:1	3.9, 5.3, 6.6	16, 21, 26, 28, 35, 44	3.9, 5.3, 6.6	16, 21, 26, 28, 35, 44
Version		Without shaft seal/With shaft seal			
Flange		Standard flange			
Shaft		Length/flat face/cross hole			

maxon Modular System

maxon EC motor	№ of stages [opt.]	Page
ECX SPEED 16 M	1–2	185–188
ECX SPEED 16 L	1–2	189–192

Dimensions M 1:1



[1]This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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*Values in parentheses apply in case of reduced speed (according to diagram).

GPX 19
Planetary Gearhead ∅19 mm

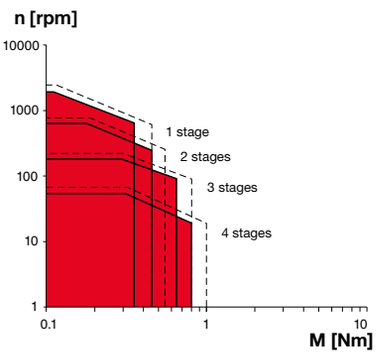
Key Data		A Standard Version	C Ceramic Version
Max. transmittable power	W	13	15.5
Max. continuous torque	Nm	0.8	1.1
Max. continuous input speed	rpm	14 000	14 000
Ambient temperature	°C	-40 ... +100	-40 ... +100
Bearing at output		Ball bearing	Ball bearing

Operating Range (output shaft)

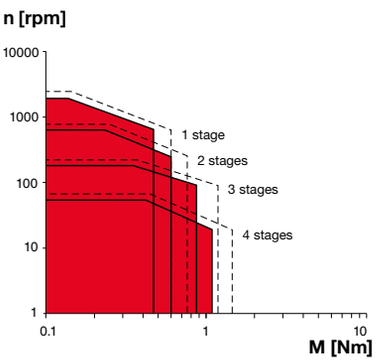
Continuous operation

Intermittent operation

A Standard Version



C Ceramic Version

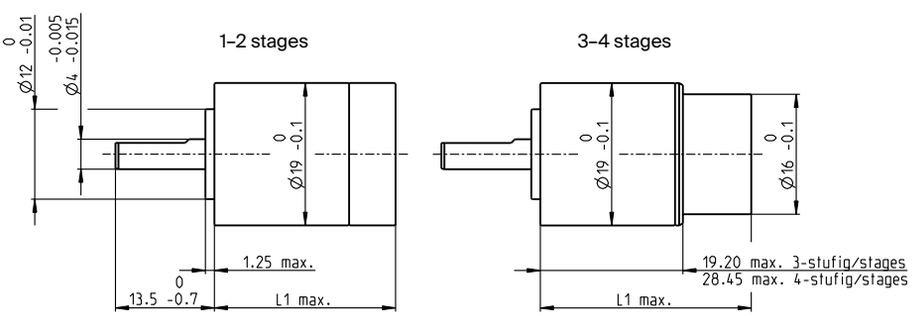


Specifications		A Standard Version				C Ceramic Version			
Number of stages		1	2	3	4	1	2	3	4
Max. transmittable continuous power	W	13.0	6.5	3.2	0.9	15.5	7.8	3.9	1.0
Max. transmittable intermittent power	W	16.2	8.1	4.1	1.1	19.4	9.7	4.9	1.3
Max. continuous torque	Nm	0.35	0.45	0.65	0.80	0.47	0.60	0.86	1.05
Max. intermittent torque	Nm	0.45	0.55	0.80	1.00	0.60	0.75	1.10	1.30
Max. continuous input speed	rpm	10000	12000	14000	14000	10000	12000	14000	14000
Max. intermittent input speed	rpm	12500	15000	17500	17500	12500	15000	17500	17500
Max. efficiency	%	90	80	75	65	90	80	75	65
Average backlash no load	°	0.9	1.15	1.25	1.35	0.9	1.15	1.25	1.35
Max. axial load (dynamic)	N	40	40	40	40	40	40	40	40
Max. radial load, 5 mm from flange	N	50	80	90	90	50	80	90	90
Gearhead length L1[1]	mm	16.7	22.9	27.0	36.2	16.7	22.9	27.0	36.2
Weight	g	30	40	43	55	30	40	43	55

Configuration		A Standard Version				C Ceramic Version			
Number of stages		1	2	3	4	1	2	3	4
Reduction Absolute reduction: (see online)	X:1	3.9, 5.3, 6.6	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526	3.9, 5.3, 6.6	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526
Version		Standard/ceramic version/noise reduced/backlash reduced/high power							
Flange		Standard flange/configurable flange							
Shaft		Length/flat face/cross hole							

maxon Modular System		Page
maxon DC motor	№ of stages [opt.]	
DCX 16 S	3–4	83–84
DCX 16 L	3–4	85–86
DCX 19 S	1–2 [3–4]	87–88
DC-max 16 S	3–4	99–100
maxon EC motor	№ of stages [opt.]	
ECX SPEED 16 M	3–4	185–188
ECX SPEED 16 L	3–4	189–192
ECX SPEED 19 M	1–2 [3–4]	193–196
ECX SPEED 19 L	1–2 [3–4]	197–200

Dimensions M 1:1



[1]This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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GPX 19
Planetary Gearhead ∅19 mm

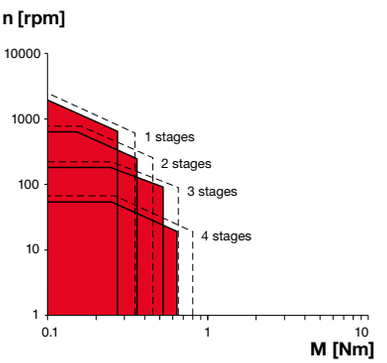
Key Data		LN Noise Reduced	LZ Backlash Reduced
Max. transmittable power	W	10.4	6.5
Max. continuous torque	Nm	0.64	0.8
Max. continuous input speed	rpm	14 000	14 000
Ambient temperature	°C	-40 ... +85	-40 ... +100
Bearing at output		Ball bearing	Ball bearing
Typical noise level	dBA	-5 dBA compared to standard configuration	

Operating Range (output shaft)

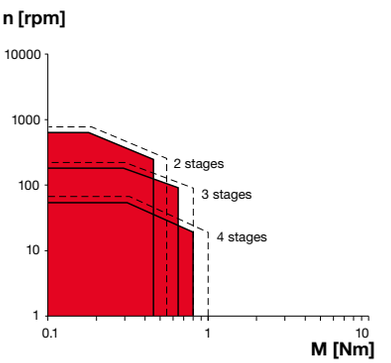
Continuous operation

Intermittent operation

LN Noise Reduced



LZ Backlash Reduced

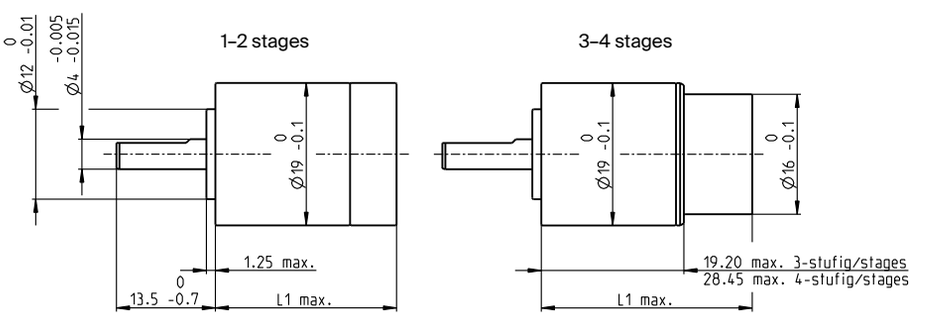


Specifications		LN Noise Reduced				LZ Backlash Reduced		
Number of stages		1	2	3	4	2	3	4
Max. transmittable continuous power	W	10.4	5.2	2.6	0.7	6.5	3.2	0.9
Max. transmittable intermittent power	W	13.0	6.5	3.2	0.9	8.1	4.1	1.1
Max. continuous torque	Nm	0.28	0.36	0.52	0.64	0.45	0.65	0.80
Max. intermittent torque	Nm	0.35	0.45	0.65	0.80	0.55	0.80	1.00
Max. continuous input speed	rpm	10000	12000	14000	14000	12000	14000	14000
Max. intermittent input speed	rpm	12500	15000	17500	17500	15000	17500	17500
Max. efficiency	%	90	80	75	65	80	75	65
Average backlash no load	°	0.9	1.15	1.25	1.35	0.8	1.0	1.15
Max. axial load (dynamic)	N	40	40	40	40	40	40	40
Max. radial load, 5 mm from flange	N	50	80	90	90	80	90	90
Gearhead length L1[1]	mm	16.7	22.9	27.0	36.2	22.9	27.0	36.2
Weight	g	30	40	43	55	40	43	55

Configuration		LN Noise Reduced				LZ Backlash Reduced		
Number of stages		1	2	3	4	2	3	4
Reduction Absolute reduction: (see online)	X:1	3.9, 5.3, 6.6	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526
Version		Standard/ceramic version/noise reduced/backlash reduced/high power						
Flange		Standard flange/configurable flange						
Shaft		Length/flat face/cross hole						

maxon Modular System		Page
maxon DC motor	№ of stages [opt.]	
DCX 16 S	3–4	83–84
DCX 16 L	3–4	85–86
DCX 19 S	1–2 [3–4]	87–88
DC-max 16 S	3–4	99–100
maxon EC motor	№ of stages [opt.]	
ECX SPEED 16 M	3–4	185–188
ECX SPEED 16 L	3–4	189–190
ECX SPEED 19 M	1–2 [3–4]	193–196
ECX SPEED 19 L	1–2 [3–4]	197–200

Dimensions M 1:1



[1]This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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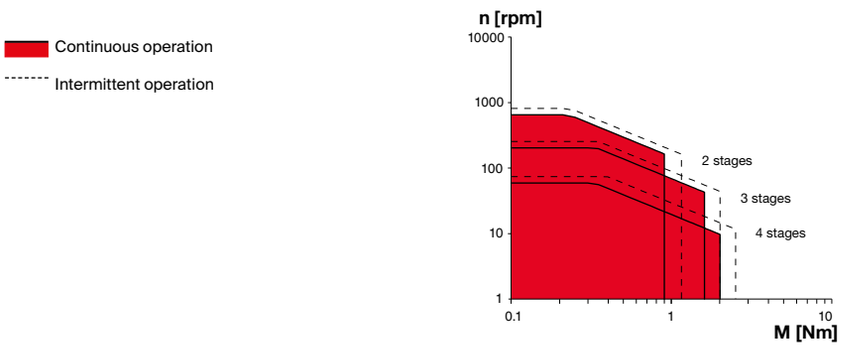
GPX 19
Planetary Gearhead ∅19 mm

Key Data		HP High Power
Max. transmittable power	W	15
Max. continuous torque	Nm	2
Max. continuous input speed	rpm	14 000
Ambient temperature	°C	-40 ... +100
Bearing at output		Ball bearing

Operating Range (output shaft) — HP High Power

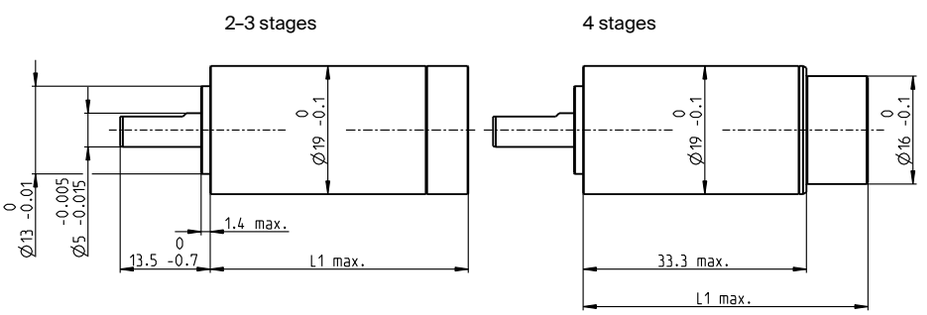


Specifications		HP High Power		
Number of stages		2	3	4
Max. transmittable power (continuous)	W	15.0	7.0	2.0
Max. transmittable power (intermittent)	W	19.0	9.0	3.0
Max. continuous torque	Nm	0.90	1.60	2.00
Max. intermittent torque	Nm	1.15	2.00	2.50
Max. continuous input speed	rpm	10000	12000	14000
Max. intermittent input speed	rpm	12500	15000	17500
Max. efficiency	%	75	65	55
Average backlash no load	°	1.15	1.25	1.35
Max. axial load (dynamic)	N	40	40	40
Max. radial load, 5 mm from flange	N	100	120	120
Gearhead length L1[1]	mm	30.8	37.0	41.0
Weight	g	51	61	63

Configuration		HP High Power		
Number of stages		2	3	4
Reduction Absolute reduction: (see online)	X:1	16, 21, 26, 28, 35	62, 83, 103, 111, 138,150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526
Version		Standard/ceramic version/noise reduced/backlash reduced/high power		
Flange		Standard flange		
Shaft		Length/flat face/cross hole		

maxon Modular System		Page
maxon DC motor	№ of stages [opt.]	
DCX 16 S	4	83–84
DCX 16 L	4	85–86
DCX 19 S	2–3 [4]	87–88
maxon EC motor	№ of stages [opt.]	
ECX SPEED 16 M	4	185–188
ECX SPEED 16 L	4	189–192
ECX SPEED 19 M	2–3 [4]	193–196
ECX SPEED 19 L	2–3 [4]	197–200

Dimensions M 1:1



[1]This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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GPX 19 SPEED

Planetary Gearhead ∅19 mm

Sterilizable

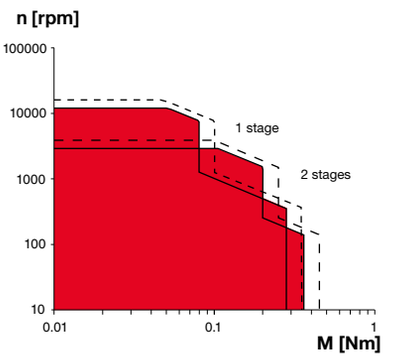
Key Data		Without shaft seal*	With shaft seal*
Max. transmittable power	W	62 (10.4)	62 (10.4)
Max. continuous torque	Nm	0.2 (0.36)	0.2 (0.36)
Max. continuous input speed	rpm	45 000	45 000
Ambient temperature	°C	-10 ... +135	-10 ... +135
Bearing at output		Ball bearing	Ball bearing

Operating Range (output shaft)

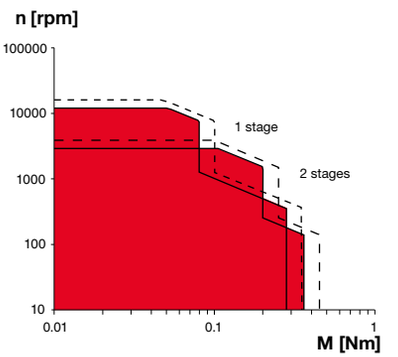
Continuous operation

Intermittent operation

Without shaft seal



With shaft seal



Sterilization information

Without shaft seal: typically 1000 autoclave cycles
With shaft seal: typically 2000 autoclave cycles

Sterilization with steam

Temperature	134°C ± 4°C
Compression pressure up to	2.3 bar
Rel. humidity	100%
Cycle length	18 minutes

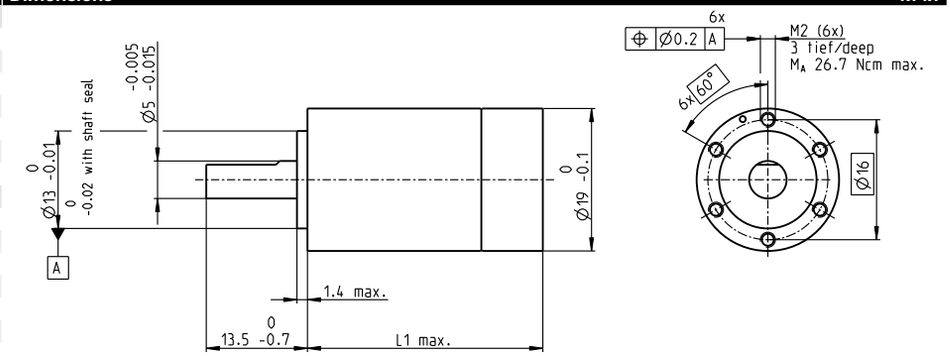
135°C

Specifications		Without shaft seal*		With shaft seal*	
Number of stages		1	2	1	2
Max. transmittable continuous power	W	62 (10.4)	31 (5.2)	62 (10.4)	31 (5.2)
Max. transmittable intermittent power	W	77 (13)	38 (6.5)	77 (13)	38 (6.5)
Max. continuous torque	Nm	0.08 (0.28)	0.2 (0.36)	0.08 (0.28)	0.2 (0.36)
Max. intermittent torque	Nm	0.1 (0.35)	0.25 (0.45)	0.1 (0.35)	0.25 (0.45)
Max. continuous input speed	rpm	45000	45000	45000	45000
Max. intermittent input speed	rpm	60000	60000	60000	60000
Max. efficiency	%	85	80	85	80
Average backlash no load	°	1.4	1.6	1.4	1.6
Max. axial load (dynamic)	N	40.0	40.0	40.0	40.0
Max. radial load, 5 mm from flange	N	50.0	85.0	35.0	55.0
Gearhead length L1[1]	mm	31.4	40.3	39.20	48.10
Weight	g	41	54	56	69

Configuration		Without shaft seal		With shaft seal	
Number of stages		1	2	1	2
Reduction Absolute reduction: (see online)	X:1	3.9, 5.3, 6.6	16, 21, 26, 28, 35, 44	3.9, 5.3, 6.6	16, 21, 26, 28, 35, 44
Version		Without shaft seal/With shaft seal			
Flange		Standard flange			
Shaft		Length/flat face/cross hole			

maxon Modular System		Page
maxon EC motor	№ of stages [opt.]	
ECX SPEED 16 M	[3]	185–188
ECX SPEED 16 L	[3]	189–192
ECX SPEED 19 M	1–2	193–196
ECX SPEED 19 L	1–2	197–200

Dimensions M 1:1



[1]This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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*Values in parentheses apply in case of reduced speed (according to diagram).

GPX 22
Planetary Gearhead ∅22 mm

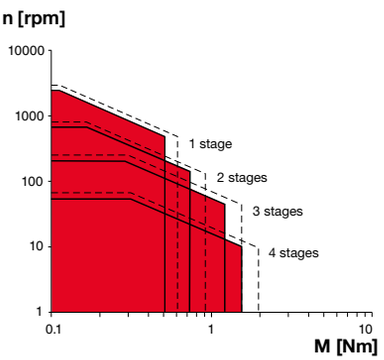
Key Data		A Standard Version	C Ceramic Version
Max. transmittable power	W	24	30
Max. continuous torque	Nm	1.5	2
Max. continuous input speed	rpm	12000	12000
Ambient temperature	°C	-40 ... +100	-40 ... +100
Bearing at output		Ball bearing	Ball bearing

Operating Range (output shaft)

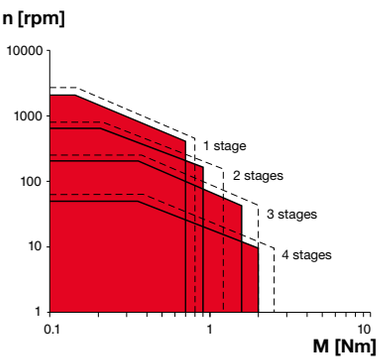
Continuous operation

Intermittent operation

A Standard Version



C Ceramic Version



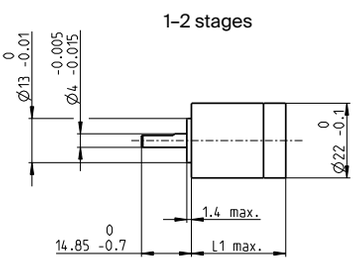
Specifications		A Standard Version				C Ceramic Version			
Number of stages		1	2	3	4	1	2	3	4
Max. transmittable power (continuous)	W	24.0	12.0	6.0	1.6	30.0	15.0	7.0	2.0
Max. transmittable power (intermittent)	W	30.0	15.0	7.5	2.0	38.0	19.0	9.0	2.5
Max. continuous torque	Nm	0.50	0.70	1.20	1.50	0.70	0.90	1.60	2.00
Max. intermittent torque	Nm	0.60	0.90	1.50	1.90	0.80	1.20	2.00	2.50
Max. continuous input speed	rpm	8000	10000	12000	12000	8000	10000	12000	12000
Max. intermittent input speed	rpm	10000	12500	15000	15000	10000	12500	15000	15000
Max. efficiency	%	90	81	74	66	90	81	74	66
Average backlash no load	°	0.85	1.05	1.2	1.35	0.85	1.05	1.2	1.35
Max. axial load (dynamic)	N	40	40	40	40	40	40	40	40
Max. radial load, 10 mm from flange	N	65	100	120	120	65	100	120	120
Gearhead length L1[1]	mm	19.9	26.4	32.2	43.0	19.9	26.4	32.2	43.0
Weight	g	45	58	67	89	45	58	67	89

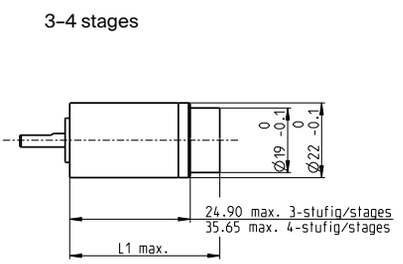
Configuration		A Standard Version				C Ceramic Version			
Number of stages		1	2	3	4	1	2	3	4
Reduction Absolute reduction: (see online)	X:1	3.9, 5.3, 6.6	16, 21, 26, 28, 35, 44	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526	3.9, 5.3, 6.6	16, 21, 26, 28, 35, 44	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526
Version		Standard/ceramic version/noise reduced/backlash reduced/high power/ultra performance							
Flange		Standard flange/configurable flange							
Shaft		Length/flat face/cross hole							

maxon Modular System		Page
maxon DC motor	№ of stages [opt.]	
DCX 19 S	3–4	87–88
DCX 22 S	1–2 [3–4]	89–90
DCX 22 L	1–2 [3–4]	91–92
DC-max 22 S*	1–2 [3–4]	101–102
maxon EC motor	№ of stages [opt.]	
ECX SPEED 19 M	3–4	193–196
ECX SPEED 19 L	3–4	197–200
ECX SPEED 22 M	1–2 [3–4]	201–204
ECX SPEED 22 L	1–2 [3–4]	205–208
ECX TORQUE 22 M	1–2	215
ECX TORQUE 22 L	1–2	216
ECX TORQUE 22 XL	1–2	217

*Limited selection of reduction ratios (see online).

Dimensions M 1:2





[1]This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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GPX 22
Planetary Gearhead ∅22 mm

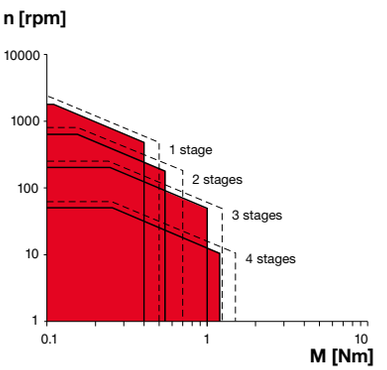
Key Data		LN Noise Reduced	LZ Backlash Reduced
Max. transmittable power	W	20	12
Max. continuous torque	Nm	1.2	1.5
Max. continuous input speed	rpm	12000	12000
Ambient temperature	°C	-40 ... +85	-40 ... +100
Bearing at output		Ball bearing	Ball bearing
Typical noise level	dBA	-5 dBA compared to standard configuration	

Operating Range (output shaft)

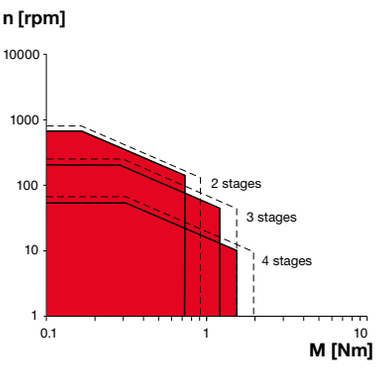
Continuous operation

Intermittent operation

LN Noise Reduced



LZ Backlash Reduced



Specifications		LN Noise Reduced				LZ Backlash Reduced		
Number of stages		1	2	3	4	2	3	4
Max. transmittable power (continuous)	W	20.0	10.0	5.0	1.3	12.0	6.0	1.6
Max. transmittable power (intermittent)	W	25.0	13.0	6.3	1.6	15.0	7.5	2.0
Max. continuous torque	Nm	0.40	0.55	1.00	1.20	0.70	1.20	1.50
Max. intermittent torque	Nm	0.50	0.70	1.25	1.50	0.90	1.50	1.90
Max. continuous input speed	rpm	8000	10000	12000	12000	10000	12000	12000
Max. intermittent input speed	rpm	10000	12500	15000	15000	12500	15000	15000
Max. efficiency	%	90	81	74	66	81	74	66
Average backlash no load	°	0.85	1.05	1.20	1.35	0.85	1.05	1.2
Max. axial load (dynamic)	N	40	40	40	40	40	40	40
Max. radial load, 10 mm from flange	N	65	100	120	120	100	120	120
Gearhead length L1[1]	mm	19.9	26.4	32.2	43.0	26.4	32.2	43.0
Weight	g	45	58	67	89	58	67	89

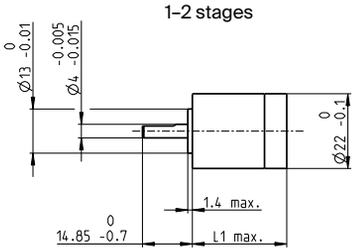
Configuration		LN Noise Reduced				LZ Backlash Reduced		
Number of stages		1	2	3	4	2	3	4
Reduction Absolute reduction: (see online)	X:1	3.9, 5.3, 6.6	16, 21, 26, 28, 35, 44	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526	16, 21, 26, 28, 35, 44	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526
Version		Standard/ceramic version/noise reduced/backlash reduced/high power/ultra performance						
Flange		Standard flange/configurable flange						
Shaft		Length/flat face/cross hole						

maxon Modular System		Page
maxon DC motor	№ of stages [opt.]	
DCX 19 S	3–4	87–88
DCX 22 S	1–2 [3–4]	89–90
DCX 22 L	1–2 [3–4]	91–92
DC-max 22 S*	1–2 [3–4]	101–102
maxon EC motor	№ of stages [opt.]	
ECX SPEED 19 M	3–4	193–194
ECX SPEED 19 L	3–4	197–198
ECX SPEED 22 M	1–2 [3–4]	201–202
ECX SPEED 22 L	1–2 [3–4]	205–206
ECX TORQUE 22 M	1–2	215
ECX TORQUE 22 L	1–2	216
ECX TORQUE 22 XL	1–2	217

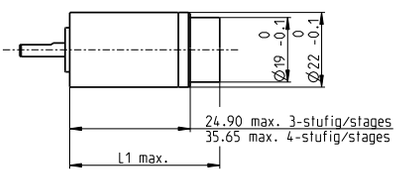
*Limited selection of reduction ratios (see online).

Dimensions M 1:2

1–2 stages



3–4 stages



[1]This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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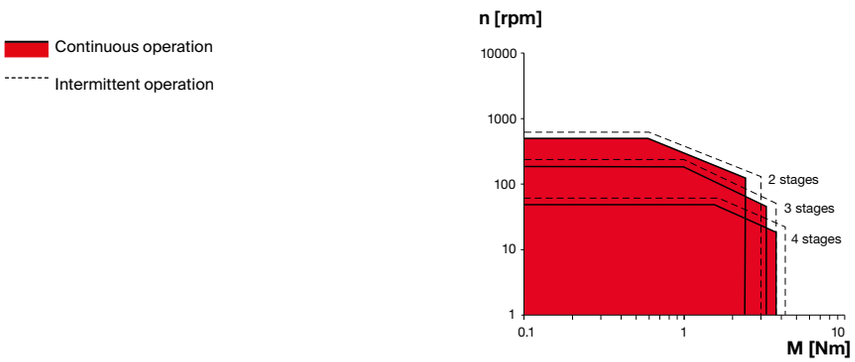
GPX 22
Planetary Gearhead ∅22 mm

Key Data		HP High Power
Max. transmittable power	W	30
Max. continuous torque	Nm	3.7
Max. continuous input speed	rpm	12000
Ambient temperature	°C	-40 ... +100
Bearing at output		Ball bearing

Operating Range (output shaft) — HP High Power



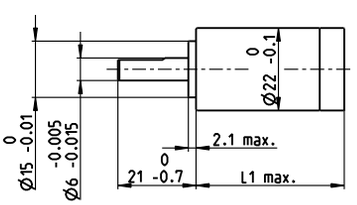
Specifications		HP High Power		
Number of stages		2	3	4
Max. transmittable power (continuous)	W	30.0	15.0	8.0
Max. transmittable power (intermittent)	W	40.0	20.0	10.0
Max. continuous torque	Nm	2.40	3.30	3.70
Max. intermittent torque	Nm	3.00	3.80	4.20
Max. continuous input speed	rpm	8000	10000	12000
Max. intermittent input speed	rpm	10000	12500	15000
Max. efficiency	%	75	65	55
Average backlash no load	°	1.05	1.2	1.35
Max. axial load (dynamic)	N	80	80	80
Max. radial load, 10 mm from flange	N	145	150	150
Gearhead length L1[1]	mm	31.7	38.2	44.0
Weight	g	73	86	95

Configuration		HP High Power		
Number of stages		2	3	4
Reduction Absolute reduction: (see online)	X:1	16, 21, 26, 28, 35, 44	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526
Version		Standard/ceramic version/noise reduced/backlash reduced/high power/ultra performance		
Flange		Standard flange		
Shaft		Length/flat face/cross hole		

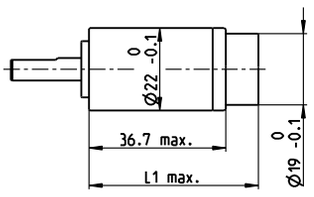
maxon Modular System		Page
maxon DC motor	№ of stages [opt.]	
DCX 19 S	4	87–88
DCX 22 S	2–3 [4]	89–90
DCX 22 L	2–3 [4]	91–92
maxon EC motor	№ of stages [opt.]	
ECX SPEED 19 M	4	193–194
ECX SPEED 19 L	4	197–198
ECX SPEED 22 M	2–3 [4]	201–202
ECX SPEED 22 L	2–3 [4]	205–206
ECX TORQUE 22 M	2–3	215
ECX TORQUE 22 L	2–3	216
ECX TORQUE 22 XL	2–3	217

Dimensions M 1:2

2–3 stages



4 stages



[1]This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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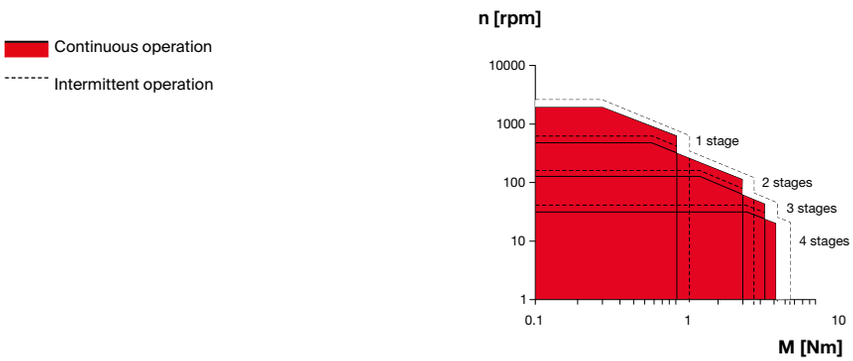
GPX 22
Planetary Gearhead ∅22 mm

Key Data		UP Ultra Performance
Max. transmittable power	W	66
Max. continuous torque	Nm	5.2
Max. continuous input speed	rpm	8000
Ambient temperature	°C	-40 ... +100
Bearing at output		Ball bearing

Operating Range (output shaft) — UP Ultra Performance

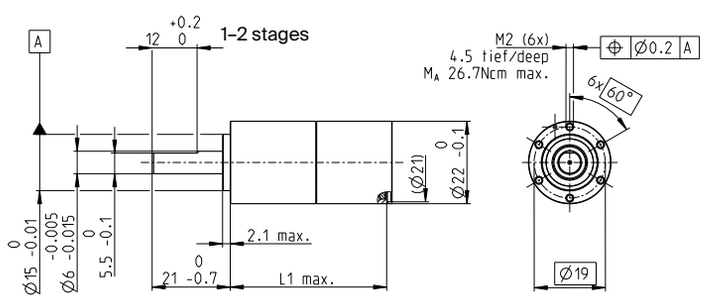


Specifications		UP Ultra Performance			
Number of stages		1	2	3	4
Max. transmittable continuous power	W	66.0	36.0	20.0	11.0
Max. transmittable intermittent power	W	82.5	45.0	25.0	14.0
Max. continuous torque	Nm	1.00	2.90	4.30	5.20
Max. intermittent torque	Nm	1.25	3.60	5.30	6.50
Max. continuous input speed	rpm	8000	8000	8000	8000
Max. intermittent input speed	rpm	10000	10000	10000	10000
Max. efficiency	%	96	93	90	87
Average backlash no load	°	0.4	0.5	0.6	0.7
Max. axial load (dynamic)	N	80	80	80	80
Max. radial load, 10 mm from flange	N	100	145	150	150
Gearhead length L1[1]	mm	22.0	32.0	42.0	52.0
Weight	g	49	69	87	106

Configuration		UP Ultra Performance			
Number of stages		1	2	3	4
Reduction Absolute reduction: (see online)	X:1	3.9, 5.3	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526
Version		Standard/ceramic version/noise reduced/backlash reduced/high power/ultra performance			
Flange		Standard flange			
Shaft		Length/flat face/cross hole			

maxon Modular System		Page
maxon DC motor	№ of stages [opt.]	
DCX 22 S	1–4	89–90
DCX 22 L	1–4	91–92
maxon EC motor		
ECX SPEED 22 M	1–4	201–202
ECX SPEED 22 L	1–4	205–206
ECX TORQUE 22 M	1–4	215
ECX TORQUE 22 L	1–4	216
ECX TORQUE 22 XL	1–4	217

Dimensions M 1:2



[1]This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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GPX 22 SPEED
Planetary Gearhead ∅22 mm
Sterilizable

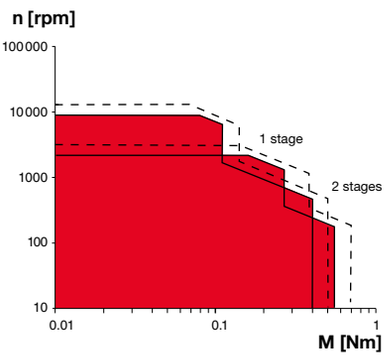
Key Data		Without shaft seal	With shaft seal
Max. transmittable power	W	74 (20)	74 (20)
Max. continuous torque	Nm	0.27 (0.55)	0.27 (0.55)
Max. continuous input speed	rpm	35 000	35 000
Ambient temperature	°C	-10 ... +135	-10 ... +135
Bearing at output		Ball bearing	Ball bearing

Operating Range (output shaft)

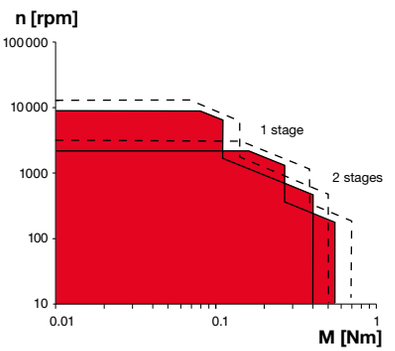
Continuous operation

Intermittent operation

Without shaft seal



With shaft seal



Sterilization information

Without shaft seal: typically 1000 autoclave cycles
With shaft seal: typically 2000 autoclave cycles

Sterilization with steam	
Temperature	134°C ± 4°C
Compression pressure up to	2.3 bar
Rel. humidity	100%
Cycle length	18 minutes

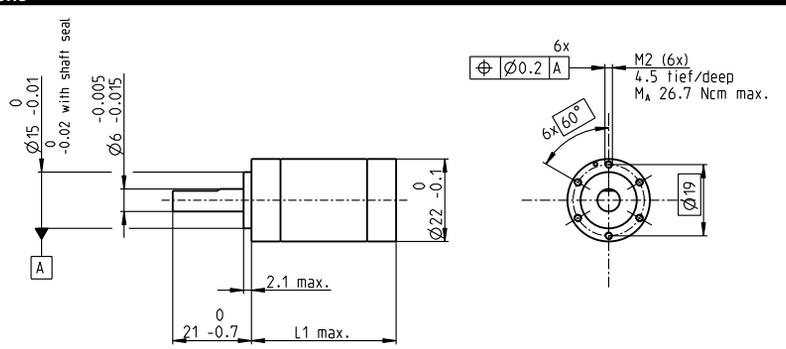
135°C

Specifications		Without shaft seal*		With shaft seal*	
Number of stages		1	2	1	2
Max. transmittable continuous power	W	74 (20)	37 (10)	74 (20)	37 (10)
Max. transmittable intermittent power	W	92 (25)	46 (13)	92 (25)	46 (13)
Max. continuous torque	Nm	0.11 (0.4)	0.27 (0.55)	0.11 (0.4)	0.27 (0.55)
Max. intermittent torque	Nm	0.14 (0.5)	0.38 (0.7)	0.14 (0.5)	0.38 (0.7)
Max. continuous input speed	rpm	35000	35000	35000	35000
Max. intermittent input speed	rpm	50000	50000	50000	50000
Max. efficiency	%	85	80	85	80
Average backlash no load	°	1.4	1.6	1.4	1.6
Max. axial load (dynamic)	N	80.0	80.0	80.0	80.0
Max. radial load, 10 mm from flange	N	45.0	75.0	30.0	50.0
Gearhead length L1[1]	mm	30.8	40.9	38.6	48.6
Weight	g	65	86	85	106

Configuration		Without shaft seal		With shaft seal	
Number of stages		1	2	1	2
Reduction Absolute reduction: (see online)	X:1	3.9, 5.3, 6.6	16, 21, 26, 28, 35, 44	3.9, 5.3, 6.6	16, 21, 26, 28, 35, 44
Version		Without shaft seal/With shaft seal			
Flange		Standard flange			
Shaft		Length/flat face/cross hole			

maxon Modular System		Page
maxon EC motor	№ of stages [opt.]	
ECX SPEED 19 M	[3]	193–196
ECX SPEED 19 L	[3]	197–200
ECX SPEED 22 M	1–2	201–202
ECX SPEED 22 L	1–2	205–206

Dimensions M 1:2



[1]This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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*Values in parentheses apply in case of reduced speed (according to diagram).

GPX 26
Planetary Gearhead ∅26 mm

GPX

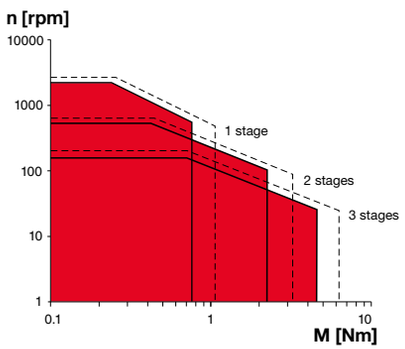
Key Data		A Standard Version	C Ceramic Version
Max. transmittable power	W	48	55
Max. continuous torque	Nm	2.25	3.0
Max. continuous input speed	rpm	8000	8000
Ambient temperature	°C	-40 ... +100	-40 ... +100
Bearing at output		Ball bearing	Ball bearing

Operating Range (output shaft)

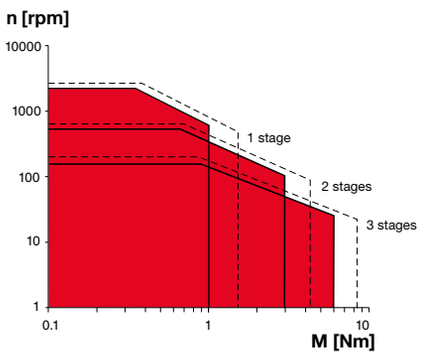
Continuous operation

Intermittent operation

A Standard Version



C Ceramic Version



Specifications		A Standard Version			C Ceramic Version		
Number of stages		1	2	3	1	2	3
Max. transmittable continuous power	W	48	24	12.0	55	30	15.0
Max. transmittable intermittent power	W	60	30	15.0	70	35	18.0
Max. continuous torque	Nm	0.75	2.25	4.50	1.00	2.60	5.00
Max. intermittent torque	Nm	1.10	3.20	6.20	1.50	3.40	6.30
Max. continuous input speed	rpm	7000	8000	10000	7000	8000	10000
Max. intermittent input speed	rpm	8750	10000	12500	8750	10000	12500
Max. efficiency	%	90	78	75	90	78	75
Average backlash no load	°	0.75	0.95	1.1	0.75	0.95	1.1
Max. axial load (dynamic)	N	80	80	80	80	80	80
Max. radial load, 10 mm from flange	N	95	145	150	95	145	150
Gearhead length L1[1]	mm	21.3	30.2	35.5	21.3	30.2	35.5
Weight	g	75	95	105	75	95	105

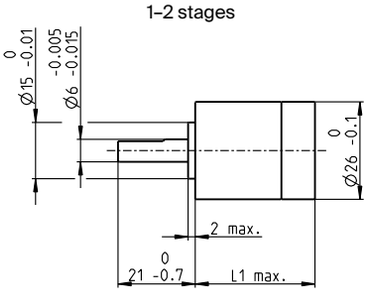
Configuration		A Standard Version			C Ceramic Version		
Number of stages		1	2	3	1	2	3
Reduction Absolute reduction: (see online)	X:1	3.9, 5.3	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	3.9, 5.3	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231
Version		Standard/ceramic version/noise reduced/reduced backlash					
Flange		Standard flange/configurable flange					
Shaft		Length/flat face/cross hole					

maxon Modular System		Page
maxon DC motor	№ of stages [opt.]	
DCX 22 S	3	89–90
DCX 22 L	3	91–92
DCX 26 L	1–2 [3]	93–94
DC-max 22 S*	3	101–102
DC-max 26 S*	1–2 [3]	103–104
maxon EC motor	№ of stages [opt.]	
ECX SPEED 22 M	3	201–202
ECX SPEED 22 L	3	205–206
ECX TORQUE 22 M	3	215
ECX TORQUE 22 L	3	216
ECX TORQUE 22 XL	3	217

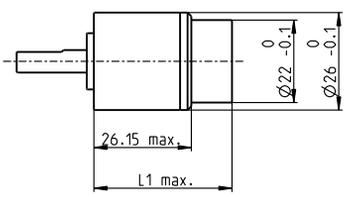
*Limited selection of reduction ratios (see online).

Dimensions M 1:2

1–2 stages



3 stages



[1]This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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GPX 26
Planetary Gearhead ∅26 mm

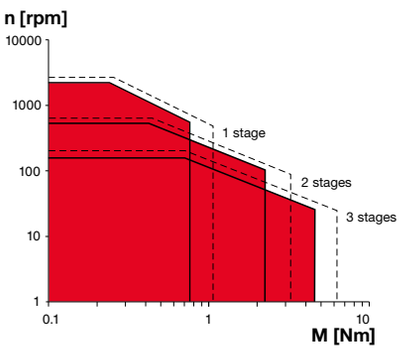
Key Data		LN Noise Reduced	LZ Backlash Reduced
Max. transmittable power	W	38	24
Max. continuous torque	Nm	1.8	2.3
Max. continuous input speed	rpm	8 000	8 000
Ambient temperature	°C	-40 ... +85	-40 ... +100
Bearing at output		Ball bearing	Ball bearing
Typical noise level	dBA	-5 dBA compared to standard configuration	

Operating Range (output shaft)

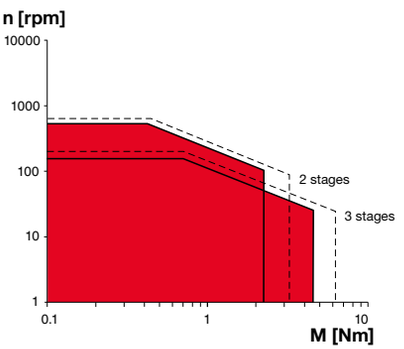
Continuous operation

Intermittent operation

LN Noise Reduced



LZ Backlash Reduced



Specifications		LN Noise Reduced			LZ Backlash Reduced	
Number of stages		1	2	3	2	3
Max. transmittable continuous power	W	38	19	10.0	24	12.0
Max. transmittable intermittent power	W	48	24	12.0	30	15.0
Max. continuous torque	Nm	0.60	1.80	3.60	2.25	4.50
Max. intermittent torque	Nm	0.75	2.25	4.50	3.20	6.20
Max. continuous input speed	rpm	7000	8000	10000	8000	10000
Max. intermittent input speed	rpm	8750	10000	12500	10000	12500
Max. efficiency	%	90	78	75	78	75
Average backlash no load	°	0.75	0.95	1.1	0.85	0.9
Max. axial load (dynamic)	N	80	80	80	80	80
Max. radial load, 10 mm from flange	N	95	145	150	145	150
Gearhead length L1[1]	mm	21.3	30.2	35.5	30.2	35.5
Weight	g	75	95	105	95	105

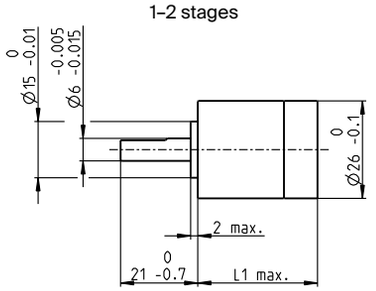
Configuration		LN Noise Reduced			LZ Backlash Reduced	
Number of stages		1	2	3	2	3
Reduction Absolute reduction: (see online)	X:1	3.9, 5.3	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231
Version		Standard/ceramic version/noise reduced/backlash reduced/high power				
Flange		Standard flange/configurable flange				
Shaft		Length/flat face/cross hole				

maxon Modular System		Page
maxon DC motor	№ of stages [opt.]	
DCX 22 S	3	89–90
DCX 22 L	3	91–92
DCX 26 L	1–2 [3]	93–94
DC-max 22 S*	3	101–102
DC-max 26 S*	1–2 [3]	103–104
maxon EC motor	№ of stages [opt.]	
ECX SPEED 22 M	3	201–202
ECX SPEED 22 L	3	205–206
ECX TORQUE 22 M	3	215
ECX TORQUE 22 L	3	216
ECX TORQUE 22 XL	3	217

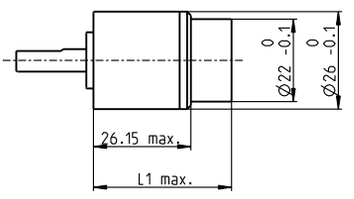
*Limited selection of reduction ratios (see online).

Dimensions M 1:2

1–2 stages



3 stages



[1]This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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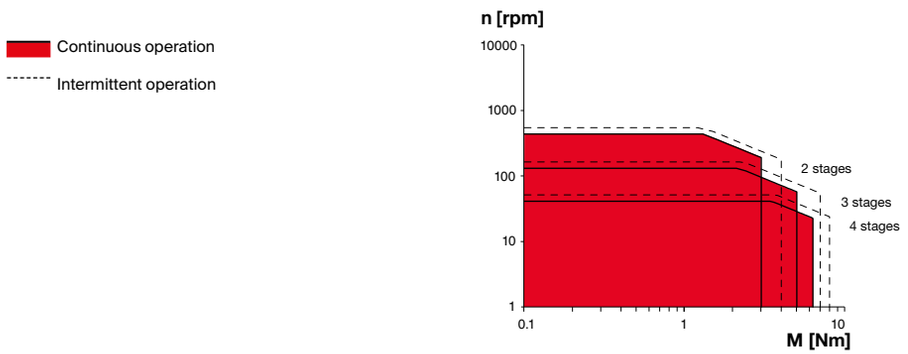
GPX 26
Planetary Gearhead ∅26 mm

Key Data		HP High Power
Max. transmittable power	W	60
Max. continuous torque	Nm	6.3
Max. continuous input speed	rpm	10 000
Ambient temperature	°C	-40 ... +100
Bearing at output		Ball bearing

Operating Range (output shaft) — HP High Power

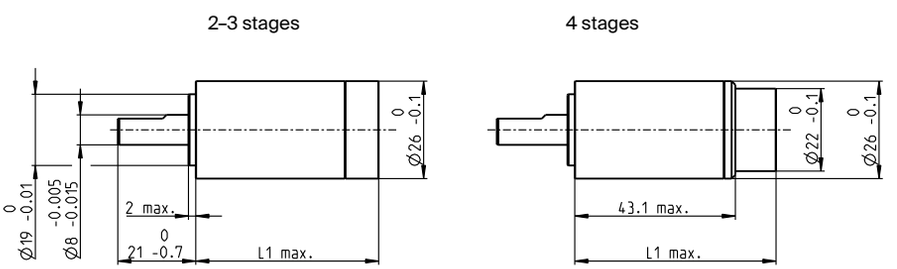


Specifications		HP High Power		
Number of stages		2	3	4
Max. transmittable power (continuous)	W	60	30	15
Max. transmittable power (intermittent)	W	75	40	20
Max. continuous torque	Nm	3.0	5.0	6.3
Max. intermittent torque	Nm	4.0	7.0	8.0
Max. continuous input speed	rpm	7000	8000	10000
Max. intermittent input speed	rpm	8750	10000	12500
Max. efficiency	%	75	65	55
Average backlash no load	°	0.95	1.1	1.3
Max. axial load (dynamic)	N	110	110	110
Max. radial load, 10 mm from flange	N	180	180	180
Gearhead length L1[1]	mm	38.2	47.1	52.4
Weight	g	122	144	153

Configuration		HP High Power		
Number of stages		2	3	4
Reduction Absolute reduction: (see online)	X:1	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526
Version		Standard/ceramic version/noise reduced/backlash reduced/high power		
Flange		Standard flange		
Shaft		Length/flat face/cross hole		

maxon Modular System		Page
maxon DC motor	№ of stages [opt.]	
DCX 22 S	4	89–90
DCX 22 L	4	91–92
DCX 26 L	2–3 [4]	93–94
maxon EC motor	№ of stages [opt.]	
ECX SPEED 22 M	4	201–202
ECX SPEED 22 L	4	205–206
ECX TORQUE 22 M	4	215
ECX TORQUE 22 L	4	216
ECX TORQUE 22 XL	4	217

Dimensions M 1:2



[1]This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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GPX 32
Planetary Gearhead ∅32 mm

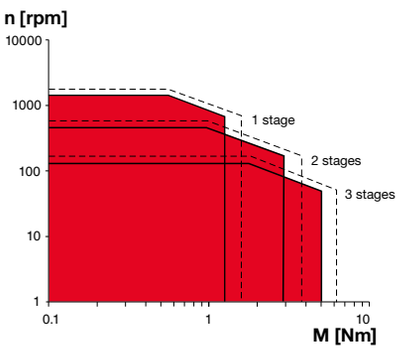
Key Data		A Standard Version	C Ceramic Version
Max. transmittable power	W	100	120
Max. continuous torque	Nm	5	6.6
Max. continuous input speed	rpm	8000	8000
Ambient temperature	°C	-40 ... +100	-40 ... +100
Bearing at output		Ball bearing	Ball bearing

Operating Range (output shaft)

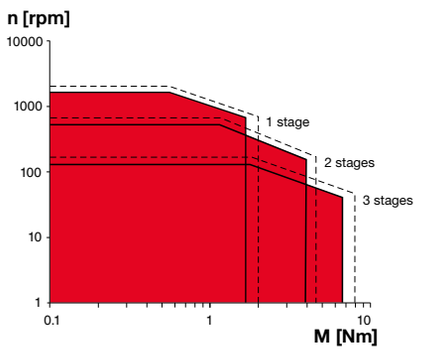
Continuous operation

Intermittent operation

A Standard Version



C Ceramic Version



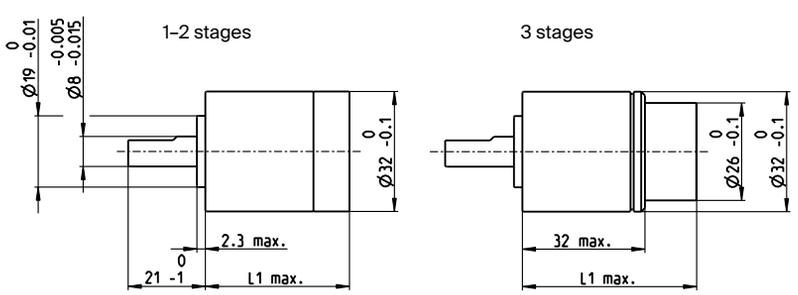
Specifications		A Standard Version			C Ceramic Version		
Number of stages		1	2	3	1	2	3
Max. transmittable continuous power	W	100	50	25	120	60	30
Max. transmittable intermittent power	W	125	62	31	150	75	37
Max. continuous torque	Nm	1.25	2.90	5.00	1.60	3.80	6.60
Max. intermittent torque	Nm	1.60	3.60	6.25	2.00	4.50	8.00
Max. continuous input speed	rpm	6000	7000	8000	6000	7000	8000
Max. intermittent input speed	rpm	7500	8750	10000	7500	8750	10000
Max. efficiency	%	90	78	75	90	78	75
Average backlash no load	°	0.55	0.7	0.9	0.55	0.7	0.9
Max. axial load (dynamic)	N	110	110	110	110	110	110
Max. radial load, 10 mm from flange	N	160	180	180	160	180	180
Gearhead length L1[1]	mm	26.7	36.3	43.9	26.7	36.3	43.9
Weight	g	140	185	230	140	185	230

Configuration		A Standard Version			C Ceramic Version		
Number of stages		1	2	3	1	2	3
Reduction Absolute reduction: (see online)	X:1	3.9, 5.3	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	3.9, 5.3	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231
Version		Standard/ceramic version/noise reduced/backlash reduced/high power/ultra performance					
Flange		Standard flange/configurable flange					
Shaft		Length/flat face/cross hole					

maxon Modular System		Page
maxon DC motor	№ of stages [opt.]	
DCX 26 L	3	93–94
DCX 32 L	1–2 [3]	95
DC-max 26 S*	3	103–104

*Limited selection of reduction ratios (see online).

Dimensions M 1:2



[1]This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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GPX 32
Planetary Gearhead ∅32 mm

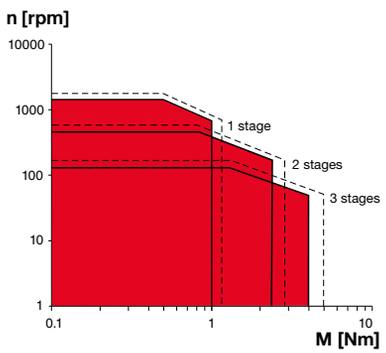
Key Data		LN Noise Reduced	LZ Backlash Reduced
Max. transmittable power	W	80	50
Max. continuous torque	Nm	4	5
Max. continuous input speed	rpm	8000	8000
Ambient temperature	°C	-40 ... +100	-40 ... +100
Bearing at output		Ball bearing	Ball bearing
Typical noise level	dBA	-5 dBA compared to standard configuration	

Operating Range (output shaft)

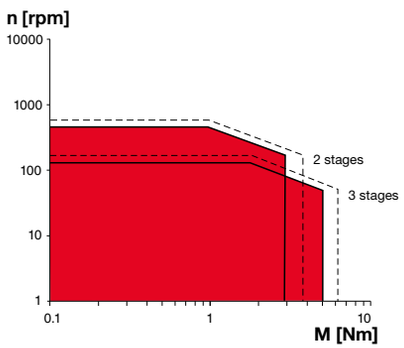
Continuous operation

Intermittent operation

LN Noise Reduced



LZ Backlash Reduced



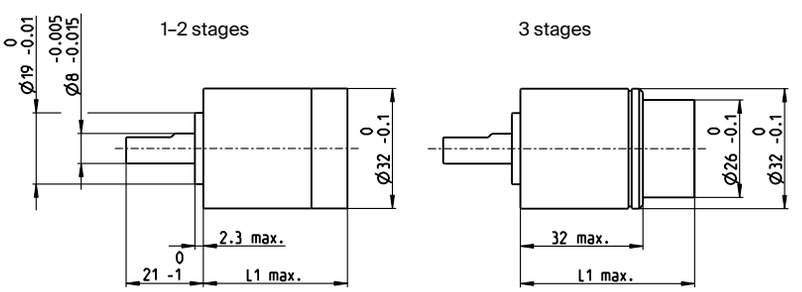
Specifications		LN Noise Reduced			LZ Backlash Reduced	
Number of stages		1	2	3	2	3
Max. transmittable continuous power	W	80	40	20	50	25
Max. transmittable intermittent power	W	100	50	25	62	31
Max. continuous torque	Nm	1.00	2.30	4.00	2.90	5.00
Max. intermittent torque	Nm	1.30	2.90	5.00	3.60	6.25
Max. continuous input speed	rpm	6000	7000	8000	7000	8000
Max. intermittent input speed	rpm	7500	8750	10000	8750	10000
Max. efficiency	%	90	78	75	78	75
Average backlash no load	°	0.55	0.7	0.9	0.55	0.75
Max. axial load (dynamic)	N	110	110	110	110	110
Max. radial load, 10 mm from flange	N	160	180	180	180	180
Gearhead length L1[1]	mm	26.7	36.3	43.9	36.3	43.9
Weight	g	140	185	230	185	230

Configuration		LN Noise Reduced			LZ Backlash Reduced	
Number of stages		1	2	3	2	3
Reduction Absolute reduction: (see online)	X:1	3.9, 5.3	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231
Version		Standard/ceramic version/noise reduced/backlash reduced/high power/ultra performance				
Flange		Standard flange/configurable flange				
Shaft		Length/flat face/cross hole				

maxon Modular System		Page
maxon DC motor	№ of stages [opt.]	
DCX 26 L	3	93–94
DCX 32 L	1–2 [3]	95
DC-max 26 S*	3	103–104

*Limited selection of reduction ratios (see online).

Dimensions M 1:2



[1]This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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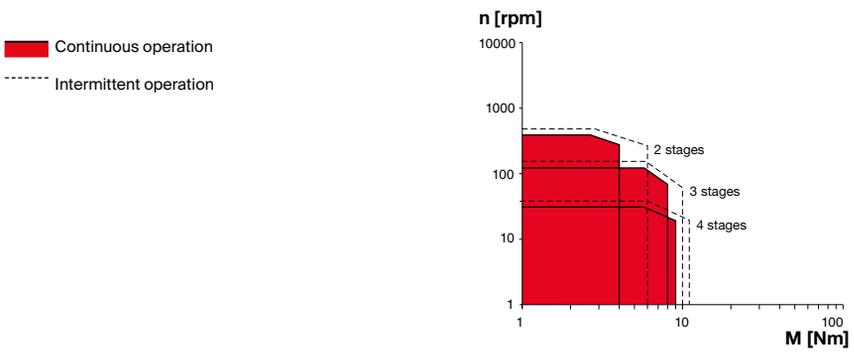
GPX 32
Planetary Gearhead ∅32 mm

Key Data		HP High Power
Max. transmittable power	W	110
Max. continuous torque	Nm	9
Max. continuous input speed	rpm	8000
Ambient temperature	°C	-40 ... +100
Bearing at output		Ball bearing

Operating Range (output shaft) — HP High Power



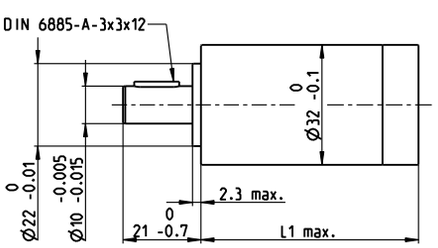
Specifications		HP High Power		
Number of stages		2	3	4
Max. transmittable power (continuous)	W	110	55	18
Max. transmittable power (intermittent)	W	140	70	25
Max. continuous torque	Nm	4.00	8.00	9.00
Max. intermittent torque	Nm	6.00	10.00	12.00
Max. continuous input speed	rpm	6000	7000	8000
Max. intermittent input speed	rpm	7500	8750	10000
Max. efficiency	%	76	65	55
Average backlash no load	°	0.7	0.9	1.1
Max. axial load (dynamic)	N	110	110	110
Max. radial load, 10 mm from flange	N	200	250	250
Gearhead length L1[1]	mm	46.3	55.9	63.5
Weight	g	200	220	250

Configuration		HP High Power		
Number of stages		2	3	4
Reduction Absolute reduction: (see online)	X:1	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526
Version		Standard/ceramic version/noise reduced/backlash reduced/high power/ultra performance		
Flange		Standard flange		
Shaft		Length/flat face/feather key		

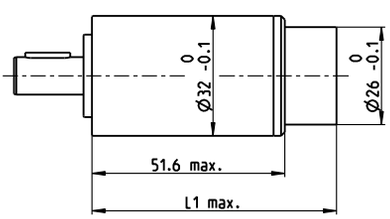
maxon Modular System		Page
maxon DC motor	№ of stages [opt.]	
DCX 26 L	4	93–94
DCX 32 L	2–3 [4]	95

Dimensions M 1:2

2–3 stages



4 stages



[1]This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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GPX 32
Planetary Gearhead ∅32 mm

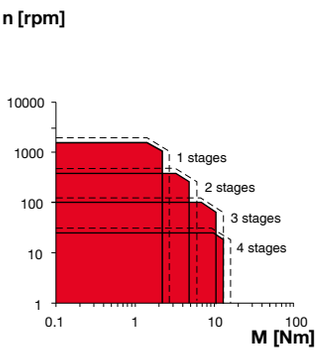
GPX

Key Data		UP Ultra Performance
Max. transmittable power	W	242
Max. continuous torque	Nm	12.6
Max. continuous input speed	rpm	6000
Ambient temperature	°C	-40 ... +100
Bearing at output		Ball bearing

Operating Range (output shaft) — UP Ultra Performance

Continuous operation

Intermittent operation



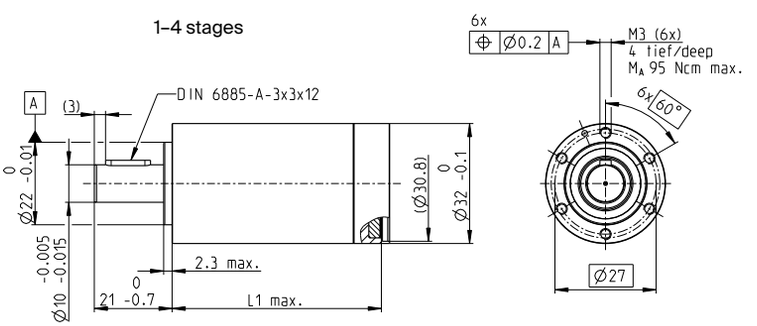
Specifications		UP Ultra Performance			
Number of stages		1	2	3	4
Max. transmittable continuous power	W	242	130	70	25
Max. transmittable intermittent power	W	300	160	85	30
Max. continuous torque	Nm	2.20	4.80	10.40	12.60
Max. intermittent torque	Nm	2.70	6.00	13.00	16.00
Max. continuous input speed	rpm	6000	6000	6000	6000
Max. intermittent input speed	rpm	7500	7500	7500	7500
Max. efficiency	%	96	93	90	87
Average backlash no load	°	0.3	0.4	0.5	0.6
Max. axial load (dynamic)	N	110	110	110	110
Max. radial load, 10 mm from flange	N	150	200	250	250
Gearhead length L1[1]	mm	32.0	47.0	62.0	77.0
Weight	g	167	231	287	350

Configuration		UP Ultra Performance			
Number of stages		1	2	3	4
Reduction Absolute reduction: (see online)	X:1	3.9, 5.3	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526
Version		Standard/ceramic version/noise reduced/backlash reduced/high power/ultra performance			
Flange		Standard flange			
Shaft		Length/flat face/feather key			

maxon Modular System		Page
maxon DC motor	№ of stages [opt.]	
DCX 32 L	1–4	95

Dimensions — M 1:2

1–4 stages



[1]This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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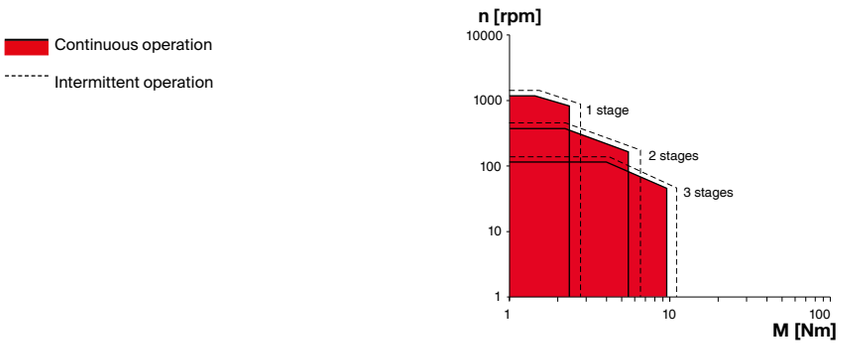
GPX 37
Planetary Gearhead ∅37 mm

Key Data		A Standard Version
Max. transmittable power	W	185
Max. continuous torque	Nm	9.3
Max. continuous input speed	rpm	7000
Ambient temperature	°C	-40 ... +100
Bearing at output		Ball bearing

Operating Range (output shaft) — A Standard Version

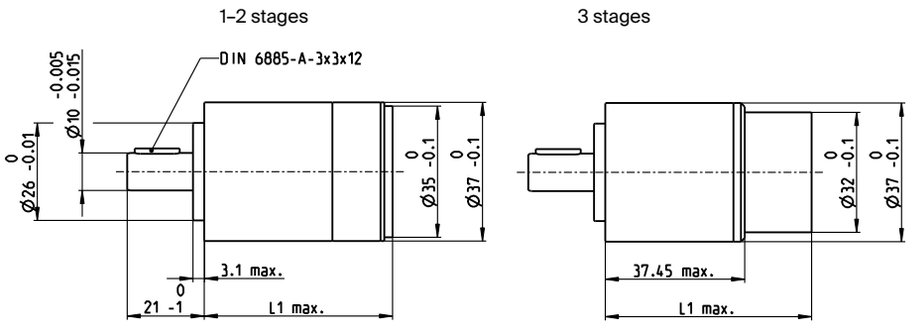


Specifications		A Standard Version		
Number of stages		1	2	3
Max. transmittable continuous power	W	185	90	45
Max. transmittable intermittent power	W	230	115	60
Max. continuous torque	Nm	2.30	5.40	9.30
Max. intermittent torque	Nm	2.90	6.80	11.60
Max. continuous input speed	rpm	5000	6000	7000
Max. intermittent input speed	rpm	6250	7500	8750
Max. efficiency	%	90	80	75
Average backlash no load	°	0.5	0.6	0.7
Max. axial load (dynamic)	N	240	240	240
Max. radial load, 10 mm from flange	N	200	250	250
Gearhead length L1[1]	mm	35.4	48.3	52.9
Weight	g	230	310	410

Configuration		A Standard Version		
Number of stages		1	2	3
Reduction Absolute reduction: (see online)	X:1	3.9	16, 26	62, 83, 103, 111, 138, 150, 172, 186, 231
Version		Standard/noise reduced/reduced backlash		
Flange		Standard flange/configurable flange		
Shaft		Length/flat face/feather key		

maxon Modular System		Page
maxon DC motor	№ of stages [opt.]	
DCX 32 L	3	95
DCX 35 L	1–2	96

Dimensions M 1:2



[1]This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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GPX 37
Planetary Gearhead ∅37 mm

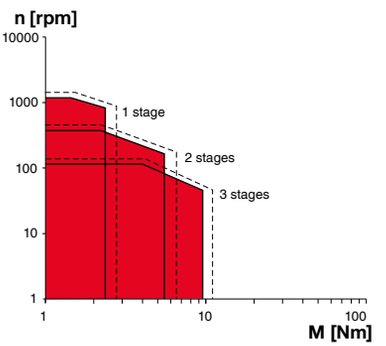
Key Data		LN Noise Reduced	LZ Backlash Reduced
Max. transmittable power	W	150	90
Max. continuous torque	Nm	7.4	9.3
Max. continuous input speed	rpm	7000	7000
Ambient temperature	°C	-40 ... +85	-40 ... +100
Bearing at output		Ball bearing	Ball bearing
Typical noise level	dBA	-5 dBA compared to standard configuration	

Operating Range (output shaft)

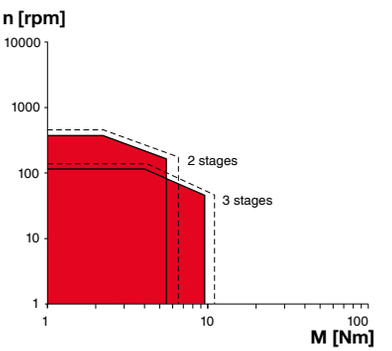
Continuous operation

Intermittent operation

LN Noise Reduced



LZ Backlash Reduced

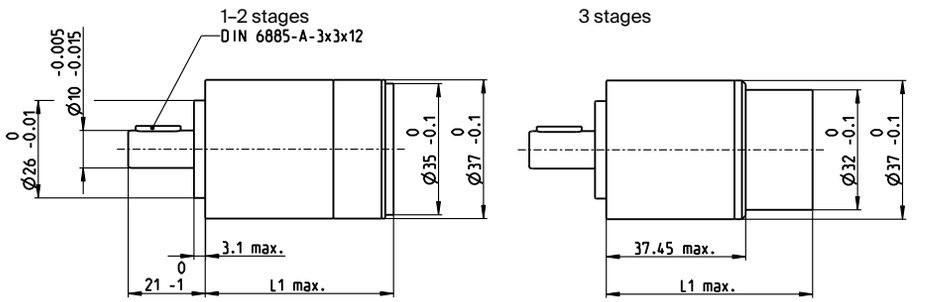


Specifications		LN Noise Reduced			LZ Backlash Reduced	
Number of stages		1	2	3	2	3
Max. transmittable continuous power	W	150	75	37	90	45
Max. transmittable intermittent power	W	185	90	45	115	60
Max. continuous torque	Nm	1.85	4.30	7.40	5.40	9.30
Max. intermittent torque	Nm	2.30	5.40	9.20	6.80	11.60
Max. continuous input speed	rpm	5000	6000	7000	6000	7000
Max. intermittent input speed	rpm	6250	7500	8750	7500	8750
Max. efficiency	%	90	80	75	80	75
Average backlash no load	°	0.5	0.6	0.7	0.4	0.5
Max. axial load (dynamic)	N	240	240	240	240	240
Max. radial load, 10 mm from flange	N	200	250	250	250	250
Gearhead length L1[1]	mm	35.4	48.3	52.9	48.3	52.9
Weight	g	230	310	410	310	410

Configuration		LN Noise Reduced			LZ Backlash Reduced	
Number of stages		1	2	3	2	3
Reduction Absolute reduction: (see online)	X:1	3.9	16, 26	62, 83, 103, 111, 138, 150, 172, 186, 231	16, 26	62, 83, 103, 111, 138, 150, 172, 186, 231
Version		Standard/noise reduced/backlash reduced				
Flange		Standard flange/configurable flange				
Shaft		Length/flat face/feather key				

maxon Modular System		Page
maxon DC motor	№ of stages [opt.]	
DCX 32 L	3	95
DCX 35 L	1–2	96

Dimensions M 1:2



[1]This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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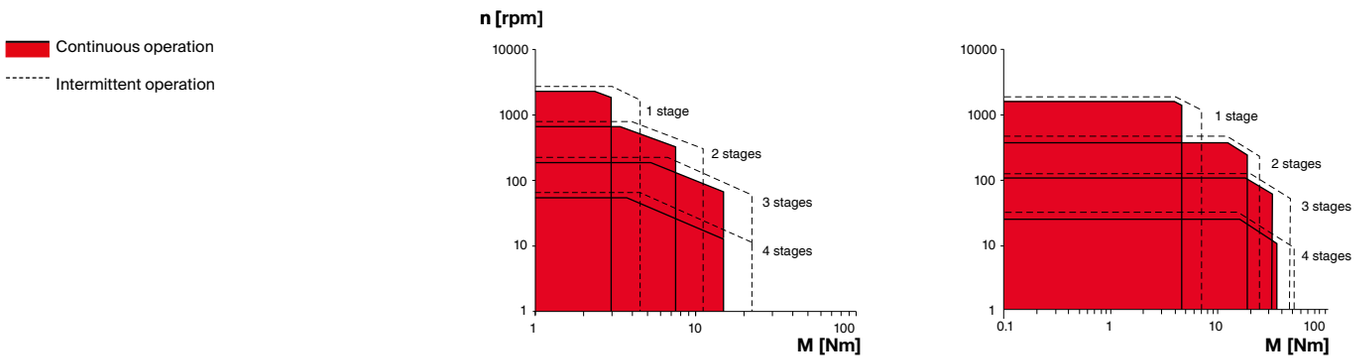
GPX 42
Planetary Gearhead ∅42 mm

GPX

Key Data		C Ceramic Version	UP Ultra Performance
Max. transmittable power	W	580	650
Max. continuous torque	Nm	15.0	35.0
Max. continuous input speed	rpm	8000	6000
Ambient temperature	°C	-40 ... +100	-40 ... +100
Bearing at output		Ball bearing	Ball bearing

Operating Range (output shaft) — C Ceramic Version — UP Ultra Performance

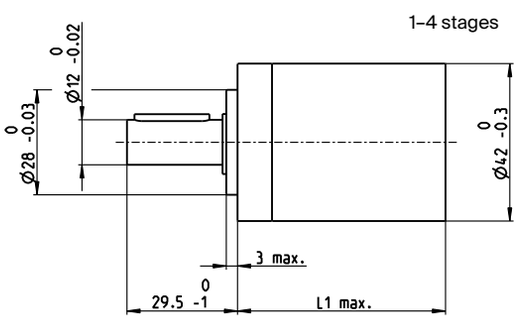


Specifications		C Ceramic Version				UP Ultra Performance			
Number of stages		1	2	3	4	1	2	3	4
Max. transmittable power (continuous)	W	580	240	100	20	650	460	200	40
Max. transmittable power (intermittent)	W	725	300	125	25	820	580	250	50
Max. continuous torque	Nm	3.0	7.5	15.0	15.0	4.5	18.0	32.0	35.0
Max. intermittent torque	Nm	4.5	11.3	22.5	22.5	7.0	24.0	46.0	50.0
Max. continuous input speed	rpm	8000	8000	8000	8000	6000	6000	6000	6000
Max. intermittent input speed	rpm	10000	10000	10000	10000	7500	7500	7500	7500
Max. efficiency	%	90	81	72	64	96	93	90	87
Average backlash no load	°	0.6	0.8	1.0	1.0	0.3	0.4	0.5	0.6
Max. axial load (dynamic)	N	150	150	150	150	200	200	200	200
Max. radial load, 12 mm from flange	N	120	240	360	360	350	525	750	750
Gearhead length L1[1]	mm	37.4	51.9	66.4	80.9	48.0	67.0	86.0	104.5
Weight	g	260	360	460	560	400	540	660	790

Configuration		C Ceramic Version				UP Ultra Performance			
Number of stages		1	2	3	4	1	2	3	4
Reduction Absolute reduction: (see online)	X:1	3.5, 4.3	12, 15, 19, 21, 26	43, 53, 66, 74, 81, 113, 126, 156	150, 186, 230, 257, 285, 319, 353, 394, 441, 488, 546, 676, 756, 936	3.9	16, 26	62, 103, 172	243, 406, 679, 1135
Version		Ceramic version/ultra performance							
Flange		Standard flange							
Shaft		Length/flat face/feather key							

maxon Modular System		Page
maxon DC motor	№ of stages [opt.]	
DCX 35 L	1–4	96

Dimensions M 1:2



[1]This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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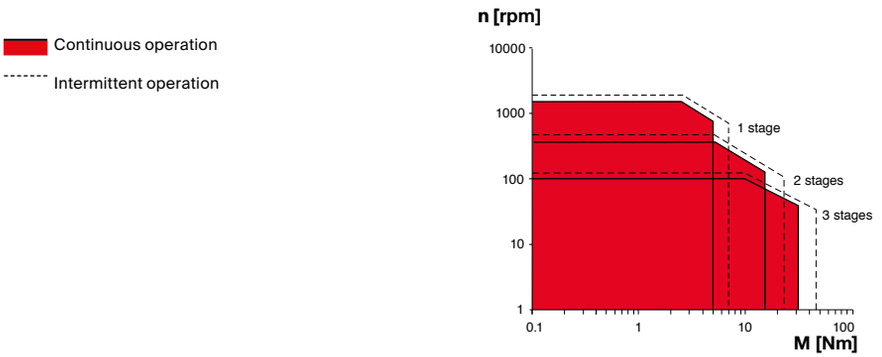
GPX 52
Planetary Gearhead ∅52 mm

NEW

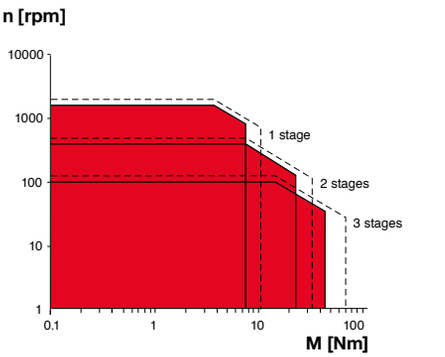
Key Data		A Standard Version	UP Ultra Performance
Max. transmittable power	W	400	600
Max. continuous torque	Nm	30.0	45.0
Max. continuous input speed	rpm	6000	6000
Ambient temperature	°C	-40...+100	-40...+100
Bearing at output		Ball bearing	Ball bearing

Operating Range (output shaft)

A Standard Version



UP Ultra Performance



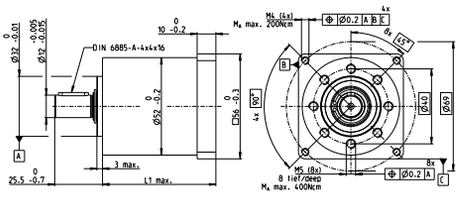
Specifications		A Standard Version			UP Ultra Performance		
Number of stages		1	2	3	1	2	3
Max. transmittable power (continuous)	W	400	200	100	600	300	150
Max. transmittable power (intermittent)	W	500	250	125	750	375	188
Max. continuous torque	Nm	5.0	15.0	30.0	7.5	22.5	45.0
Max. intermittent torque	Nm	7.0	23.0	45.0	10.5	34.5	67.5
Max. continuous input speed	rpm	6000	6000	6000	6000	6000	6000
Max. intermittent input speed	rpm	7500	7500	7500	7500	7500	7500
Max. efficiency	%	95.0	92.0	89.0	95	92	89
Average backlash no load	°	0.5	0.6	0.8	0.30	0.40	0.50
Max. axial load (dynamic)	N	200	200	200	200	200	200
Max. permissible radial load, 10 mm from flange	N	420	630	900	420	630	900
Gearhead length L1[1]	mm	44	61	78	44	61	78
Weight	g	687	855	1080	694	861	1086

Configuration	A Standard Version			UP Ultra Performance		
Number of stages	1	2	3	1	2	3
Reduction	3.9, 5.3, 6.6	16, 21, 26, 28, 35, 44	62, 83, 103, 111, 138, 150, 172, 186, 231, 287	3.9, 5.3, 6.6	16, 21, 26, 28, 35, 44	62, 83, 103, 111, 138, 150, 172, 186, 231, 287
Version	Standard/noise reduced/ultra performance					
Flange	Standard flange					
Shaft						

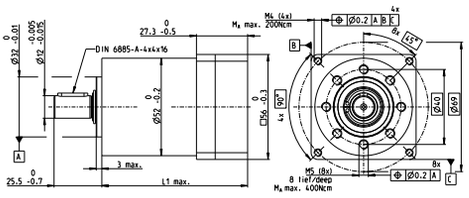
maxon Modular System		Page
maxon DC motor	№ of stages [opt.]	
maxon EC motor	№ of stages [opt.]	
IDX 56 M		221
IDX 56 L		222
maxon IDX drive	№ of stages [opt.]	
IDX 56 M	1–3	315
IDX 56 L	1–3	316

Dimensions M 1:4

1–2 stages



3 stages



[1]This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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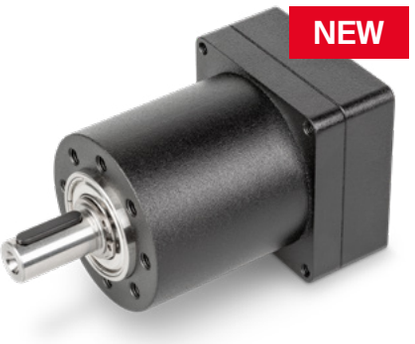
GPX 52
Planetary Gearhead∅52 mm

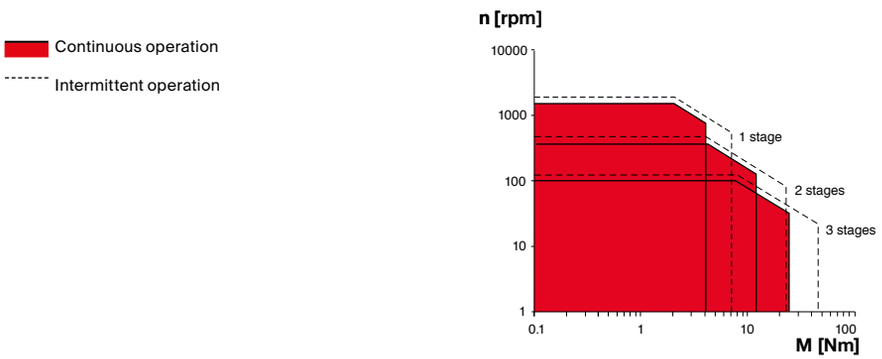
NEW



GPX

Key Data		LN Noise Reduced
Max. transmittable power	W	320
Max. continuous torque	Nm	24.0
Max. continuous input speed	rpm	6000
Ambient temperature	°C	-40...+100
Bearing at output		Ball bearing
Typical noise level	dBA	-5 dBA compared to standard configuration

Operating Range (output shaft) — LN Noise Reduced

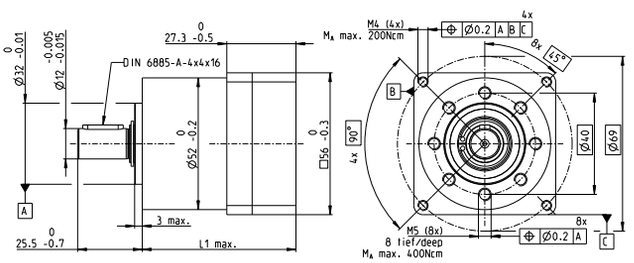


Specifications		LN Noise Reduced		
Number of stages		1	2	3
Max. transmittable power (continuous)	W	320	160	80
Max. transmittable power (intermittent)	W	400	200	100
Max. continuous torque	Nm	4.0	12.0	24.0
Max. intermittent torque	Nm	7.0	23.0	45.0
Max. continuous input speed	rpm	6000	6000	6000
Max. intermittent input speed	rpm	7500	7500	7500
Max. efficiency	%	90	83	78
Average backlash no load	°	0.50	0.60	0.80
Max. axial load (dynamic)	N	200	200	200
Max. permissible radial load, 10 mm from flange	N	420	630	900
Gearhead length L1[1]	mm	44	61	78
Weight	g	687	861	1143

Configuration	LN Noise Reduced		
Number of stages	1	2	3
Reduction	3.9, 5.3, 6.6, 9	16, 21, 26, 28, 35, 36, 44, 48, 59	62, 83, 103, 111, 138, 150, 172, 186, 231,254, 287, 315, 392
Version	Standard/noise reduced/ultra performance		
Flange	Standard flange		
Shaft			

maxon Modular System		Page
maxon DC motor	№ of stages [opt.]	
maxon EC motor	№ of stages [opt.]	
IDX 56 M		221
IDX 56 L		222
maxon IDX drive	№ of stages [opt.]	
IDX 56 M	1–3	315
IDX 56 L	1–3	316

Dimensions M 1:3



[1]This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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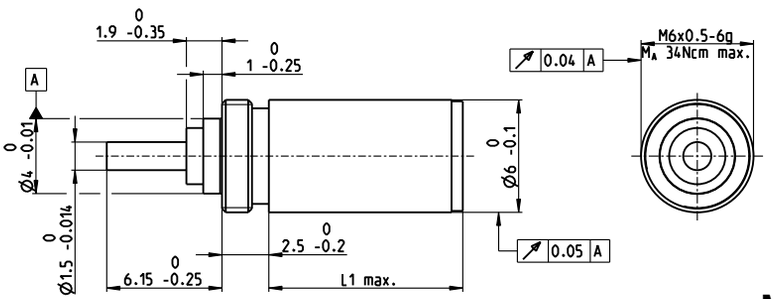
For your personal notes

maxon gear

Precision spur- and planetary gearheads matched to maxon motors. Gears are advantageously adapted directly to the desired motors in the delivery plant. The motor pinion is the input gearwheel for the first stage and is rigidly affixed to the motor shaft.

Planetary Gearhead GP 6 A ∅6 mm, 0.002–0.03 Nm

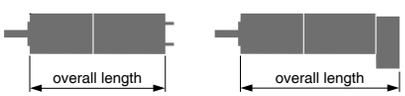


M 5:2

Technical Data					
Planetary Gearhead	straight teeth				
Output shaft	stainless steel				
Bearing at output	ball bearing				
Option	sleeve bearing				
Radial play, 5 mm from flange	max. 0.12 mm				
Axial play	max. 0.10 mm				
Max. axial load (dynamic)	5 N				
Max. force for press fits	10 N				
Direction of rotation, drive to output	=				
Max. continuous input speed	40 000 rpm				
Recommended temperature range	-40...+100°C				
Number of stages	1	2	3	4	5
Max. radial load, 5 mm from flange	5 N	6 N	7 N	8 N	8 N

Stock program
Standard program
Special program (on request)

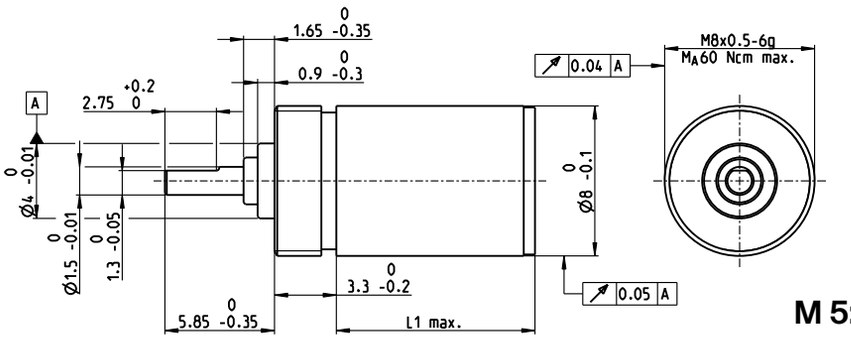
Part Numbers	472919	472920	472921	472229	472922
Gearhead Data					
1 Reduction	3.9:1	15:1	57:1	221:1	854:1
2 Absolute reduction	$^{27}/_{7}$	$^{729}/_{49}$	$^{19683}/_{343}$	$^{531441}/_{2401}$	$^{14348907}/_{16807}$
3 Max. motor shaft diameter mm	1	1	1	1	1
4 Number of stages	1	2	3	4	5
5 Max. continuous torque Nm	0.002	0.005	0.010	0.030	0.030
6 Max. intermittent torque at gear output Nm	0.005	0.010	0.020	0.060	0.060
7 Max. efficiency %	88	77	68	60	52
8 Weight g	1.7	2.1	2.5	2.9	3.3
9 Average backlash no load °	1.8	2.0	2.2	2.5	2.8
10 Mass inertia gcm^2	0.001	0.001	0.001	0.001	0.001
11 Gearhead length L1 mm	5.3	7.8	10.4	13.0	15.6



maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor/brake) + assembly parts				
RE 6, 0.3 W, A	107			21.0	23.5	26.1	28.7	31.3
RE 6, 0.3 W, B	107			25.0	27.5	30.1	32.7	35.3

Planetary Gearhead GP 8 A ∅8 mm, 0.01–0.1 Nm



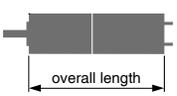
M 5:2

Technical Data	
Planetary Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	ball bearing
Radial play, 5 mm from flange	max. 0.08 mm
Axial play	max. 0.08 mm
Max. axial load (dynamic)	5 N
Max. force for press fits	10 N
Direction of rotation, drive to output	=
Max. continuous input speed	12 000 rpm
Recommended temperature range	-15...+80°C

Number of stages	1	2	3	4	5
Max. radial load, 5 mm from flange	5 N	6 N	7 N	8 N	8 N

Stock program
Standard program
Special program (on request)

Part Numbers	468999	468998	474124	468997	474127	468996	474129	468995
Gearhead Data								
1 Reduction	4:1	16:1	36:1	64:1	216:1	256:1	1296:1	1024:1
2 Absolute reduction	4	16	36	64	216	256	1296	1024
3 Max. motor shaft diameter mm	1	1	0.65	1	0.65	1	0.65	1
4 Number of stages	1	2	2	3	3	4	4	5
5 Max. continuous torque Nm	0.01	0.020	0.008	0.060	0.020	0.080	0.040	0.100
6 Max. intermittent torque at gear output Nm	0.015	0.030	0.012	0.090	0.030	0.120	0.060	0.150
7 Max. efficiency %	90	81	76	73	66	65	57	59
8 Weight g	2.6	3.2	3.2	3.8	3.8	4.4	4.4	5.0
9 Average backlash no load °	1.80	2.0	2.4	2.2	2.6	2.50	2.8	2.80
10 Mass inertia gcm^2	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
11 Gearhead length L1 mm	5.5	8.1	8.3	10.7	11.1	13.3	13.9	15.9

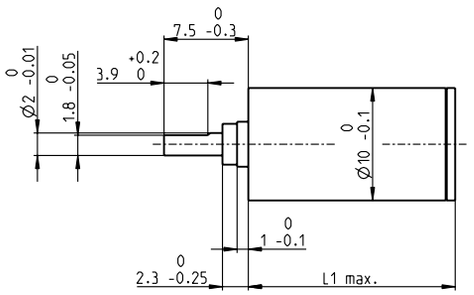


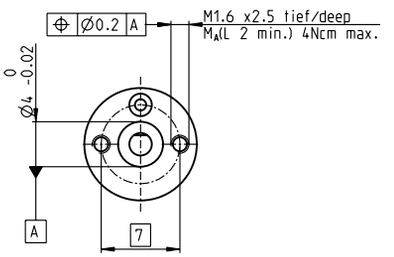
maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor/brake) + assembly parts							
RE 8, 0.5 W, A	108			22.2	24.8	25.0	27.4	27.8	30.0	30.6	32.6
RE 8, 0.5 W, B	108			25.2	27.8	28.0	30.4	30.8	33.0	33.6	35.6
RE 8, 0.5 W, A	108	MR	458	28.8	31.4	31.6	34.0	34.4	36.6	37.2	39.2
RE 8, 0.5 W, A	108	8 OPT	465	30.4	33.0	33.2	35.6	36.0	38.2	38.8	40.8

Planetary Gearhead GP 10 K ∅10 mm, 0.005–0.1 Nm

Plastic Version



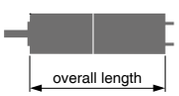


M 3:2

Technical Data	
Planetary Gearhead	straight teeth
Housing	plastic
Output shaft	stainless steel
Bearing at output	sleeve bearing
Radial play, 5 mm from flange	max. 0.14 mm
Axial play	0.02–0.10 mm
Max. axial load (dynamic)	2 N
Max. force for press fits	10 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-15...+80°C
Max. radial load, 5 mm from flange	1 N

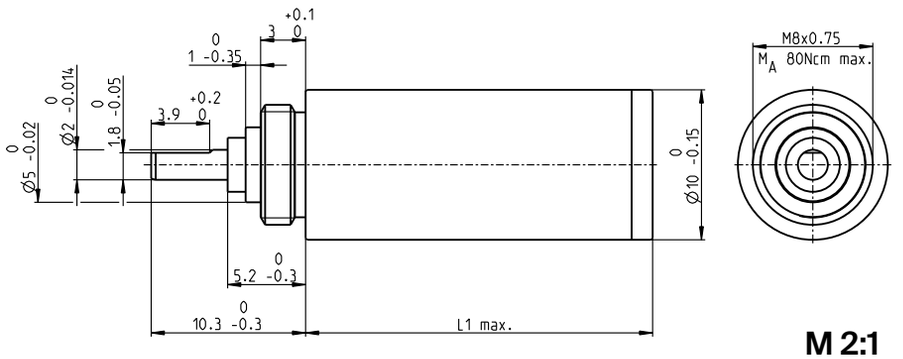
Stock program
Standard program
Special program (on request)

Gearhead Data		Part Numbers				
		110308	110309	110310	110311	110312
1 Reduction		4:1	16:1	64:1	256:1	1024:1
2 Absolute reduction		4	16	64	256	1024
3 Max. motor shaft diameter	mm	1.2	1.2	1.2	1.2	1.2
4 Number of stages		1	2	3	4	5
5 Max. continuous torque	Nm	0.005	0.015	0.054	0.100	0.100
6 Max. intermittent torque at gear output	Nm	0.005	0.015	0.054	0.100	0.100
7 Max. efficiency	%	90	80	70	60	55
8 Weight	g	2.1	2.5	2.8	3.2	3.6
9 Average backlash no load	°	1.8	2.0	2.2	2.5	2.8
10 Mass inertia	gcm²	0.004	0.003	0.003	0.003	0.003
11 Gearhead length L1	mm	10.2	14.3	18.4	22.5	26.6



maxon Modular System								
+ Motor	Page	+ Sensor/Brake	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor/brake) + assembly parts				
RE 10, 0.75 W	109/110			27.3	31.4	35.5	39.6	43.7
RE 10, 0.75 W	110	MR	457/458	33.1	37.2	41.3	45.4	49.5
RE 10, 1.5 W	111/112			34.9	39.0	43.1	47.2	51.3
RE 10, 1.5 W	112	MR	457/458	40.7	44.8	48.9	53.0	57.1
EC 9.2 flat, 0.5 W	275			22.8	26.9	31.0	35.1	39.2

Planetary Gearhead GP 10 A ∅10 mm, 0.01–0.15 Nm



M 2:1

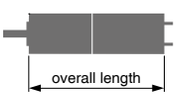
Technical Data					
Planetary Gearhead	straight teeth				
Output shaft	stainless steel				
Bearing at output	preloaded ball bearings				
Radial play, 5 mm from flange	max. 0.08 mm				
Axial play at axial load	< 2 N	0 mm			
	> 2 N	max. 0.04 mm			
Max. axial load (dynamic)	5 N				
Max. force for press fits	10 N				
Direction of rotation, drive to output	=				
Max. continuous input speed	12000 rpm				
Recommended temperature range	-40...+80°C				
Number of stages	1	2	3	4	5
Max. radial load, 5 mm from flange	5 N	10 N	15 N	20 N	25 N

gear

Stock program
Standard program
Special program (on request)

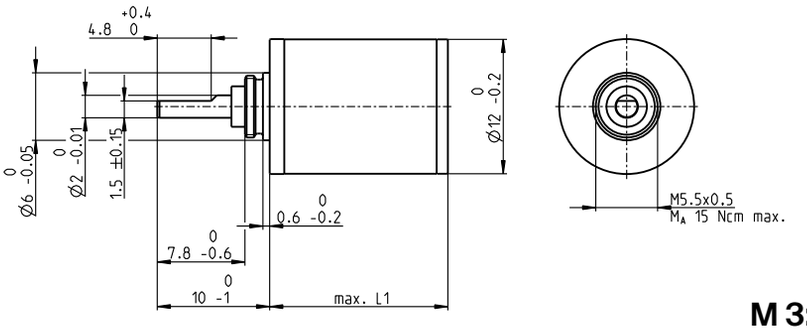
Part Numbers										
218415	218416	218417	218418	218419	332422	332423	332424	332425	332426

Gearhead Data											
1	Reduction		4:1	16:1	64:1	256:1	1024:1	4:1	16:1	64:1	256:1	1024:1
2	Absolute reduction		4	16	64	256	1024	4	16	64	256	1024
3	Max. motor shaft diameter	mm	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
4	Number of stages		1	2	3	4	5	1	2	3	4	5
5	Max. continuous torque	Nm	0.010	0.030	0.100	0.150	0.150	0.010	0.030	0.100	0.150	0.150
6	Max. intermittent torque at gear output	Nm	0.020	0.050	0.150	0.200	0.200	0.020	0.050	0.150	0.200	0.200
7	Max. efficiency	%	90	81	73	65	59	90	81	73	65	59
8	Weight	g	6.7	7.2	7.7	8.2	8.7	6.7	7.2	7.7	8.2	8.7
9	Average backlash no load	°	1.5	1.8	2.0	2.2	2.5	1.5	1.8	2.0	2.2	2.5
10	Mass inertia	gcm²	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
11	Gearhead length L1	mm	10.4	14.1	17.2	20.4	23.5	10.4	14.1	17.2	20.4	23.5



maxon Modular System												
+ Motor	Page	**+ Sensor/Brake**	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor/brake) + assembly parts									
RE 10, 0.75 W	109/110			27.5	31.2	34.3	37.5	40.6					
RE 10, 0.75 W	110	MR	457/458	33.3	37.0	40.1	43.3	46.4					
RE 10, 1.5 W	111/112			35.1	38.8	41.9	45.1	48.2					
RE 10, 1.5 W	112	MR	457/458	40.9	44.6	47.7	50.9	54.0					
A-max 12	147/148			31.7	35.4	38.5	41.7	44.8					
A-max 12, 0.5 W	148	MR	457/458	35.8	39.5	42.6	45.8	48.9					
EC 10, 8 W	225								36.2	39.9	43.0	46.2	49.3
EC 9.2 flat, 0.5 W	275			23.0	26.7	29.8	33.0	36.1					

Spur Gearhead GS 12 A ∅12 mm, 0.01–0.03 Nm

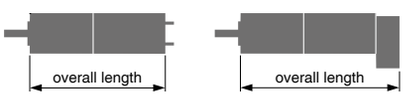


M 3:2

Technical Data	
Spur Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	sleeve bearing
Radial play, 6.5 mm from flange	max. 0.05 mm
Axial play	0.02–0.12 mm
Max. axial load (dynamic)	2 N
Max. force for press fits	30 N
Max. continuous input speed	8000 rpm
Recommended temperature range	-15...+100°C
Extended range as option	-40...+100°C
Max. radial load, 6.5 mm from flange	2 N

Stock program
Standard program
Special program (on request)

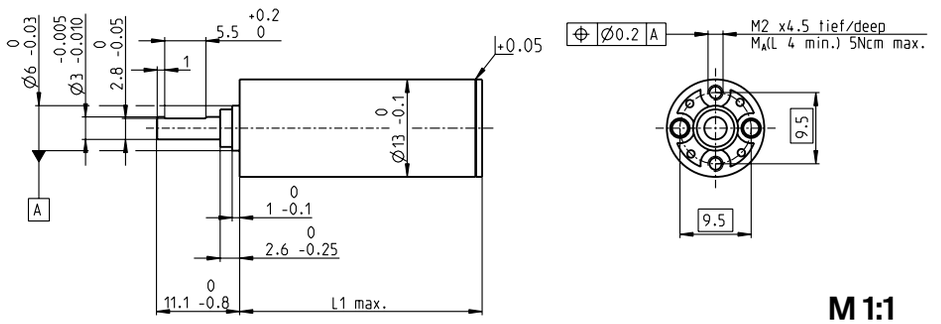
Gearhead Data			Part Numbers						
			310301	313872	313990	313991	310311	313993	310316
1	Reduction		6.4:1	13:1	58:1	141:1	371:1	485:1	3101:1
2	Absolute reduction		403/63	21866/1694	724594/12474	20138716/142884	26782109/72171	624300196/1285956	11537547853/3720087
3	Max. motor shaft diameter	mm	1.2	1.0	1.0	1.2	1.0	1.2	1.2
	Part Numbers		310302	310304	310307	313992		310313	310317
1	Reduction		9.1:1	22:1	76:1	200:1		900:1	4402:1
2	Absolute reduction		899/99	12493/567	387283/5103	22462414/112266		372178963/413343	25737606749/5845851
3	Max. motor shaft diameter	mm	1.0	1.2	1.2	1.0		1.2	1.0
	Part Numbers			310305	310308	310310		310314	
1	Reduction			31:1	108:1	261:1		1278:1	
2	Absolute reduction			27869/891	863939/8019	12005773/45927		830245379/649539	
3	Max. motor shaft diameter	mm		1.0	1.0	1.2		1.0	
4	Number of stages		2	3	4	5	5	6	7
5	Max. continuous torque	Nm	0.010	0.015	0.020	0.025	0.025	0.030	0.030
6	Max. intermittent torque at gear output	Nm	0.030	0.035	0.040	0.045	0.045	0.050	0.050
12	Direction of rotation, drive to output		=	≠	=	≠	≠	=	≠
7	Max. efficiency	%	81	73	66	59	59	53	48
8	Weight	g	6.5	7.4	8.3	9.2	9.2	10.1	11
9	Average backlash no load	°	1	1	1.2	1.2	1.2	1.2	1.5
10	Mass inertia	gcm²	0.002	0.002	0.002	0.002	0.002	0.002	0.002
11	Gearhead length L1	mm	10	12	14	16	16	18	20



maxon Modular System				Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts						
+ Motor	Page	+ Sensor/Brake	Page							
A-max 12	147/148			31.3	33.3	35.3	37.3	37.3	39.3	41.3
A-max 12, 0.5 W	148	MR	457/458	35.4	37.4	39.4	41.4	41.4	43.4	45.4

Planetary Gearhead GP 13 K ∅13 mm, 0.05–0.15 Nm

Plastic Version

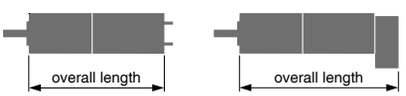


M 1:1

Technical Data					
Planetary Gearhead					straight teeth
Housing, planetary wheels					plastic
Output shaft					stainless steel, hardened
Bearing at output					sleeve bearing
Radial play, 6 mm from flange					max. 0.12 mm
Axial play					0.02–0.10 mm
Max. axial load (dynamic)					5 N
Max. force for press fits					100 N
Direction of rotation, drive to output					=
Max. continuous input speed					8000 rpm
Recommended temperature range					-15...+80°C
Number of stages	1	2	3	4	5
Max. radial load, 6 mm from flange	2 N	3 N	4 N	5 N	5 N

Stock program
Standard program
Special program (on request)

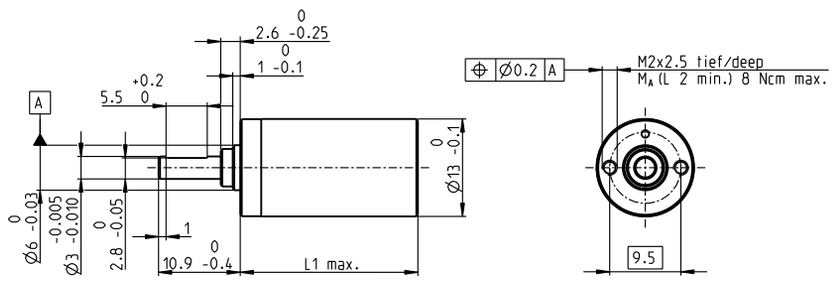
Part Numbers					
	137149	137150	137151	137152	137153
Gearhead Data					
1 Reduction	4.1:1	17:1	67:1	275:1	1119:1
2 Absolute reduction	57/14	3249/196	185193/2744	1055601/38416	60169205/537824
3 Max. motor shaft diameter mm	1.5	1.	1.5	1.5	1.5
4 Number of stages	1	2	3	4	5
5 Max. continuous torque Nm	0.050	0.075	0.100	0.125	0.150
6 Max. intermittent torque at gear output Nm	0.050	0075	0.100	0.125	0.150
7 Max. efficiency %	85	70	60	50	45
8 Weight g	5.9	6.5	7.0	7.5	8.0
9 Average backlash no load °	1.8	2.0	2.2	2.5	2.8
10 Mass inertia gcm²	0.025	0.009	0.008	0.008	0.008
11 Gearhead length L1 mm	15.5	21.4	25.1	28.8	32.5



maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor/brake) + assembly parts				
RE 13	114/116			34.8	40.7	44.4	48.1	51.8
RE 13, 0.75 W	116	MR	457-459	41.9	47.8	51.5	55.2	58.9
RE 13	118/120			47.0	52.9	56.6	60.3	64.0
RE 13, 2 W	120	MR	457-459	54.1	60.0	63.7	67.4	71.1
RE 13, 1.5 W	122/124			37.9	43.8	47.5	51.2	54.9
RE 13, 1.5 W	124	MR	457-459	44.0	49.9	53.6	57.3	61.0
RE 13, 3 W	126/128			50.1	56.0	59.7	63.4	67.1
RE 13, 3 W	128	MR	457-459	56.2	62.1	65.8	69.5	73.2
A-max 12	147/148			36.8	42.7	46.4	50.1	53.8
A-max 12, 0.5 W	148	MR	457-459	40.7	46.6	50.3	54.0	57.7

Planetary Gearhead GP 13 A ∅13 mm, 0.2–0.35 Nm



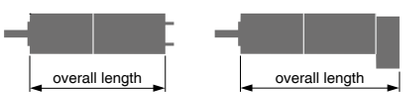
M 1:1

Technical Data					
Planetary Gearhead	straight teeth				
Output shaft	stainless steel, hardened				
Bearing at output	sleeve bearing				
Radial play, 6 mm from flange	max. 0.055 mm				
Axial play	0.02–0.10 mm				
Max. axial load (dynamic)	8 N				
Max. force for press fits	100 N				
Direction of rotation, drive to output	=				
Max. continuous input speed	8000 rpm				
Recommended temperature range	-40...+100°C				
Number of stages	1	2	3	4	5
Max. radial load, 6 mm from flange	8 N	12 N	16 N	20 N	20 N

Stock program
Standard program
Special program (on request)

Gearhead Data			Part Numbers				
			110313	110314	110315	110316	110317
1	Reduction		4.1:1	17:1	67:1	275:1	1119:1
2	Absolute reduction		57/14	3249/196	185193/2744	1055600/38416	601692057/537824
3	Max. motor shaft diameter	mm	1.5	1.5	1.5	1.5	1.5
	Part Numbers		352365	352366	**352367**	352368	352369
1	Reduction		5.1:1	26:1	131:1	664:1	3373:1
2	Absolute reduction		66/13	4356/169	287496/2197	18974736/28561	1252332576/371293
3	Max. motor shaft diameter	mm	1.5	1.5	1.5	1.5	1.5
4	Number of stages		1	2	3	4	5
5	Max. continuous torque	Nm	0.20	0.20	0.30	0.30	0.35
6	Max. intermittent torque at gear output	Nm	0.30	0.30	0.45	0.45	0.53
7	Max. efficiency	%	91	83	75	69	62
8	Weight	g	11	14	17	20	23
9	Average backlash no load	°	1.0	1.2	1.5	1.8	2.0
10	Mass inertia	gcm²	0.025	0.015	0.015	0.015	0.015
11	Gearhead length L1*	mm	16.0	19.9	23.7	27.6	31.4

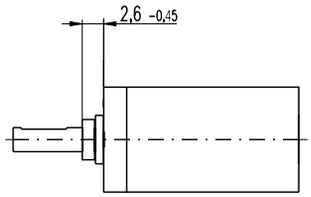
* for A-max 12 is L1 + 0.3 mm



maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor/brake) + assembly parts				
RE 13	114/116			35.4	39.3	43.1	47.0	50.8
RE 13, 0.75 W	116	MR	457-459	42.5	46.4	50.2	54.1	57.9
RE 13	118/120			47.6	51.5	55.3	59.2	63.0
RE 13, 2 W	120	MR	457-459	54.7	58.6	62.4	66.3	70.1
RE 13, 1.5 W	122/124			38.5	42.4	46.2	50.1	53.9
RE 13, 1.5 W	124	MR	457-459	44.6	48.5	52.3	56.2	60.0
RE 13, 3 W	126/128			50.7	54.6	58.4	62.3	66.1
RE 13, 3 W	128	MR	457-459	56.8	60.7	64.5	68.4	72.2
A-max 12	147/148			37.6	41.5	45.3	49.2	53.0
A-max 12, 0.5 W	148	MR	457-459	41.7	45.6	49.4	53.3	57.1

Option Ball Bearing



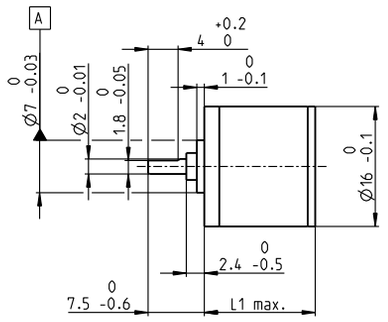
Gearhead length: L1 + 0.2 mm

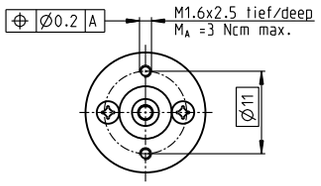
Part Numbers			
4.1:1	144300	131:1	352393
5.1:1	352391	275:1	144303
17:1	144301	664:1	352394
26:1	352392	1119:1	144304
67:1	144302	3373:1	352395

Technical Data					
Planetary Gearhead	straight teeth				
Output shaft	stainless steel, hardened				
Bearing at output	preloaded ball bearings				
Radial play, 6 mm from flange	max. 0.04 mm				
Axial play at axial load	< 5 N	0 mm			
	> 5 N	max. 0.04 mm			
Max. axial load (dynamic)	8 N				
Max. force for press fits	25 N				
Direction of rotation, drive to output	=				
Max. continuous input speed	8000 rpm				
Recommended temperature range	-40...+100°C				
Number of stages	1	2	3	4	5
Max. radial load, 6 mm from flange	10 N	15 N	20 N	25 N	25 N
Gearhead values according to sleeve bearing version					

Spur Gearhead GS 16 K ∅16 mm, 0.01–0.03 Nm

Plastic Version



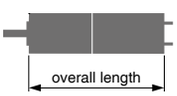


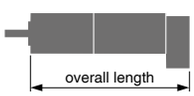
M 1:1

Technical Data	
Spur Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	sleeve bearing
Radial play, 6.5 mm from flange	max. 0.15 mm
Axial play	0.02–0.12 mm
Max. axial load (dynamic)	2 N
Max. force for press fits	15 N
Max. continuous input speed	8000 rpm
Recommended temperature range	-15...+80°C
Max. radial load, 6.5 mm from flange	1 N

Stock program
Standard program
Special program (on request)

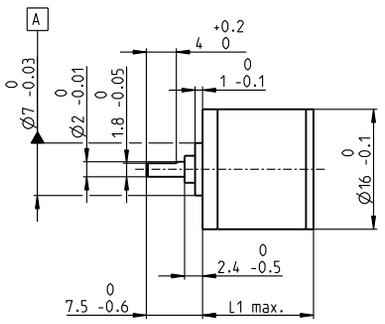
Gearhead Data		Part Numbers					
		201463	201465	201467	201469	201471	201473
1 Reduction		6.4:1	22:1	76:1	261:1	900:1	3101:1
2 Absolute reduction		403/63	12493/567	387283/5103	12005773/45927	372178963/413343	11537547853/3720087
3 Max. motor shaft diameter	mm	1.5	1.5	1.5	1.5	1.5	1.5
Part Numbers		207405	207406	207407	207408	207409	207410
1 Reduction		9.1:1	31:1	108:1	371:1	1278:1	4402:1
2 Absolute reduction		899/99	27869/891	863939/8019	26782109/72171	830245379/649539	25737606749/5845851
3 Max. motor shaft diameter	mm	1.5	1.5	1.5	1.5	1.5	1.5
Part Numbers		201464	201466	201468	201470	201472	201474
1 Reduction		12:1	41:1	141:1	485:1	1670:1	5752:1
2 Absolute reduction		961/81	29791/729	923521/6561	28629151/59049	887503681/531441	27512614111/4782969
3 Max. motor shaft diameter	mm	1	1	1	1	1	1
4 Number of stages		2	3	4	5	6	7
5 Max. continuous torque	Nm	0.010	0.020	0.030	0.030	0.030	0.030
6 Max. intermittent torque at gear output	Nm	0.10	0.10	0.10	0.10	0.10	0.10
12 Direction of rotation, drive to output		=	≠	=	≠	=	≠
7 Max. efficiency	%	81	73	66	59	53	48
8 Weight	g	9.0	9.8	10.2	10.7	11.3	11.7
9 Average backlash no load	°	1.0	1.0	1.2	1.2	1.5	1.5
10 Mass inertia	gcm²	0.0032	0.0031	0.0031	0.0031	0.0031	0.0031
11 Gearhead length L1	mm	11.8	12.8	14.8	16.8	18.8	20.8

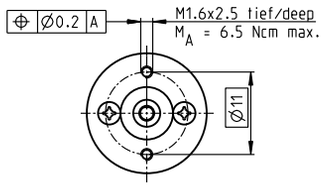




maxon Modular System									
+ Motor	Page	+ Sensor/Brake	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor/brake) + assembly parts					
A-max 16	149-152			37.3	38.3	40.3	42.3	44.3	46.3
A-max 16	150/152	MR	460/461	42.3	43.3	45.3	47.3	49.3	51.3

Spur Gearhead GS 16 A ∅16 mm, 0.015–0.04 Nm



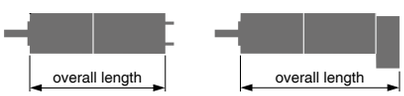


M 1:1

Technical Data	
Spur Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	sleeve bearing
Radial play, 6.5 mm from flange	max. 0.15 mm
Axial play	0.02–0.12 mm
Max. axial load (dynamic)	2 N
Max. force for press fits	30 N
Max. continuous input speed	8000 rpm
Recommended temperature range	-15...+100°C
Extended range as option	-40...+100°C
Max. radial load, 6.5 mm from flange	2 N

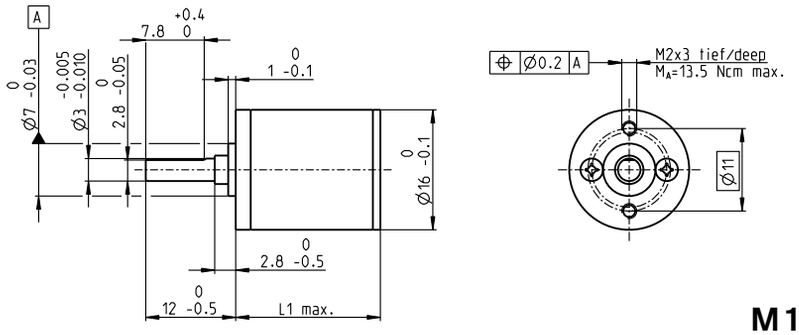
Stock program
Standard program
Special program (on request)

Gearhead Data			Part Numbers						
			144409	143761	143763	143765	143767	143769	
1	Reduction		6.4:1	22:1	76:1	261:1	900:1	3101:1	
2	Absolute reduction		$^{403}/_{63}$	$^{12493}/_{567}$	$^{387283}/_{5103}$	$^{12005773}/_{45927}$	$^{372178963}/_{413343}$	$^{11537547853}/_{3720087}$	
3	Max. motor shaft diameter	mm	1.5	1.5	1.5	1.5	1.5	1.5	
	Part Numbers		207834	207835	207836	207837	207838	207839	
1	Reduction		9.1:1	31:1	108:1	371:1	1278:1	4402:1	
2	Absolute reduction		$^{899}/_{99}$	$^{27869}/_{891}$	$^{863939}/_{8019}$	$^{26782109}/_{72171}$	$^{830245379}/_{649539}$	$^{25737606749}/_{5845851}$	
3	Max. motor shaft diameter	mm	1.5	1.5	1.5	1.5	1.5	1.5	
	Part Numbers		144410	143762	143764	143766	143768	143770	
1	Reduction		12:1	41:1	141:1	485:1	1670:1	5752:1	
2	Absolute reduction		$^{961}/_{81}$	$^{2979}/_{729}$	$^{92352}/_{6561}$	$^{2862915}/_{59049}$	$^{88750368}/_{531441}$	$^{27512614111}/_{4782969}$	
3	Max. motor shaft diameter	mm	1	1	1	1	1	1	
4	Number of stages		2	3	4	5	6	7	
5	Max. continuous torque	Nm	0.015	0.025	0.035	0.040	0.040	0.040	
6	Max. intermittent torque at gear output	Nm	0.10	0.10	0.10	0.10	0.10	0.10	
12	Direction of rotation, drive to output		=	≠	=	≠	=	≠	
7	Max. efficiency	%	81	73	66	59	53	48	
8	Weight	g	9.0	9.8	10.2	10.7	11.3	11.7	
9	Average backlash no load	°	1.0	1.0	1.2	1.2	1.5	1.5	
10	Mass inertia	gcm^2	0.0032	0.0031	0.0031	0.0031	0.0031	0.0031	
11	Gearhead length L1	mm	11.8	12.8	14.8	16.8	18.8	20.8	



maxon Modular System										
+ Motor	Page	**+ Sensor/Brake**	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor/brake) + assembly parts					
A-max 16	149-152			37.3	38.3	40.3	42.3	44.3	46.3
A-max 16	150/152	MR	460/461	42.3	43.3	45.3	47.3	49.3	51.3

Spur Gearhead GS 16 V ∅16 mm, 0.06–0.1 Nm
Reinforced



M 1:1

Technical Data

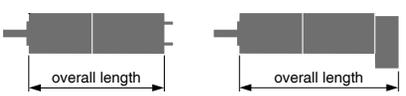
Spur Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	preloaded ball bearings
Radial play, 6.5 mm from flange	max. 0.02 mm
Axial play at axial load	< 5 N 0 mm
	> 5 N max. 0.05 mm
Max. axial load (dynamic)	5 N
Max. force for press fits	5 N
Max. continuous input speed	8000 rpm
Recommended temperature range	-15...+100°C
Extended range as option	-40...+100°C

Number of stages	2	3	4	5	6	7
Max. radial load, 6.5 mm from flange	10 N	15 N	20 N	22 N	22 N	22 N

gear

Stock program
Standard program
Special program (on request)

Gearhead Data		Part Numbers					
		235066	235070	235073	235076	235079	235082
1 Reduction		6.4:1	22:1	76:1	261:1	900:1	3101:1
2 Absolute reduction		403/63	12493/567	387283/5103	12005773/45927	372178963/413343	11537547853/3720087
3 Max. motor shaft diameter	mm	1.5	1.5	1.5	1.5	1.5	1.5
Part Numbers		235068	235071	235074	235077	235080	235083
1 Reduction		9.1:1	31:1	108:1	371:1	1278:1	4402:1
2 Absolute reduction		899/99	27869/891	863939/8019	26782109/72171	830245379/649539	25737606749/5845851
3 Max. motor shaft diameter	mm	1.5	1.5	1.5	1.5	1.5	1.5
Part Numbers		235069	235072	235075	235078	235081	235084
1 Reduction		12:1	41:1	141:1	485:1	1670:1	5752:1
2 Absolute reduction		96/1	2979/729	92352/6561	28629151/59049	887503681/531441	27512614111/4782969
3 Max. motor shaft diameter	mm	1	1	1	1	1	1
4 Number of stages		2	3	4	5	6	7
5 Max. continuous torque	Nm	0.06	0.06	0.10	0.10	0.10	0.10
6 Max. intermittent torque at gear output	Nm	0.15	0.15	0.30	0.30	0.30	0.30
12 Direction of rotation, drive to output		=	≠	=	≠	=	≠
7 Max. efficiency	%	81	73	66	59	53	48
8 Weight	g	13.8	14.5	15.8	17.0	17.9	18.5
9 Average backlash no load	°	1.0	1.0	1.2	1.2	1.5	1.5
10 Mass inertia	gcm²	0.0057	0.0052	0.0035	0.0032	0.0032	0.0032
11 Gearhead length L1	mm	14.3	17.3	19.3	21.3	23.3	25.3

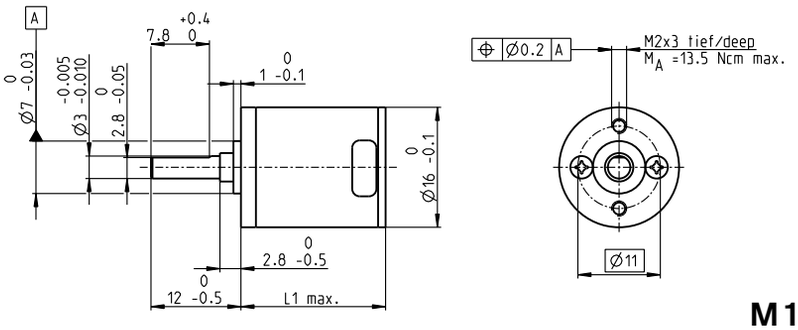


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor/brake) + assembly parts					
A-max 16	149-152			39.8	42.8	44.8	46.8	48.8	50.8
A-max 16	150/152	MR	460/461	44.8	47.8	49.8	51.8	53.8	55.8

Spur Gearhead GS 16 VZ ∅16 mm, 0.1 Nm

Low Backlash

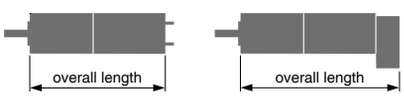


M 1:1

Technical Data			
Spur Gearhead	straight teeth		
Output shaft	stainless steel, hardened		
Bearing at output	preloaded ball bearings		
Radial play, 6.5 mm from flange	max. 0.02 mm		
Axial play at axial load	< 5 N	0 mm	
	> 5 N	max. 0.05 mm	
Max. axial load (dynamic)	5 N		
Max. force for press fits	5 N		
Max. continuous input speed	8000 rpm		
Recommended temperature range	-15...+100°C		
Extended range as option	-40...+100°C		
Number of stages	4	5	6
Max. radial load, 6.5 mm from flange	20 N	22 N	22 N

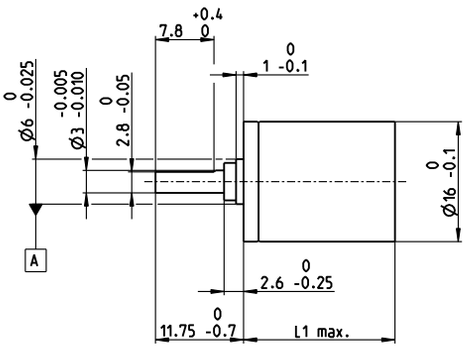
Stock program
Standard program
Special program (on request)

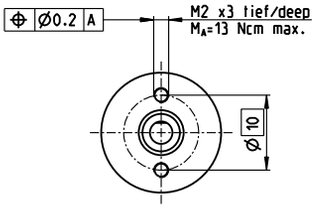
Gearhead Data			Part Numbers		
			327789	327796	327800
1	Reduction		76:1	261:1	900:1
2	Absolute reduction		387283/5103	12005773/45927	372178963/413343
3	Max. motor shaft diameter	mm	1.5	1.5	1.5
	Part Numbers		327788	327797	327801
1	Reduction		108:1	371:1	1278:1
2	Absolute reduction		863939/8019	26782109/72171	830245379/649539
3	Max. motor shaft diameter	mm	1.5	1.5	1.5
	Part Numbers		327790	327799	327802
1	Reduction		141:1	485:1	1670:1
2	Absolute reduction		923521/6561	28629151/59049	887503681/531441
3	Max. motor shaft diameter	mm	1	1	1
4	Number of stages		4	5	6
5	Max. continuous torque	Nm	0.10	0.10	0.10
6	Max. intermittent torque at gear output	Nm	0.30	0.30	0.30
12	Direction of rotation, drive to output		=	≠	=
7	Max. efficiency	%	62	54	48
8	Weight	g	17.2	18.7	20.2
9	Average backlash no load	°	0.3	0.45	0.5
10	Mass inertia	gcm²	0.017	0.014	0.013
11	Gearhead length L1	mm	19.3	21.3	23.3



maxon Modular System				Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts		
+ Motor	Page	+ Sensor/Brake	Page			
A-max 16	149-152			44.8	46.8	48.8
A-max 16	150/152	MR	460/461	49.8	51.8	53.8

Planetary Gearhead GP 16 A ∅16 mm, 0.1–0.3 Nm





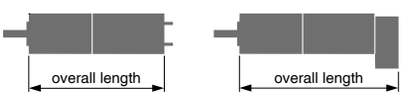
M 1:1

Technical Data	
Planetary Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	sleeve bearing
Radial play, 6 mm from flange	max. 0.06 mm
Axial play	0.02–0.10 mm
Max. axial load (dynamic)	8 N
Max. force for press fits	100 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-30...+100°C
Extended range as option	-40...+100°C
Number of stages	1 2 3 4 5
Max. radial load, 6 mm from flange	8 N 12 N 16 N 20 N 20 N

gear

Stock program
Standard program
Special program (on request)

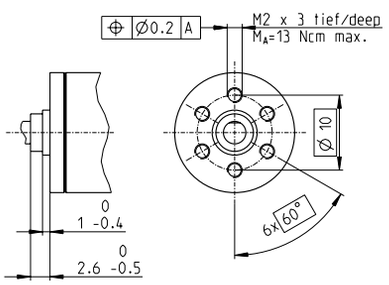
Part Numbers	110321	110322	110323	118186	110324	134782	110325	134785
Gearhead Data								
1 Reduction	4.4:1	19:1	84:1	157:1	370:1	690:1	1621:1	3027:1
2 Absolute reduction	57/13	3249/169	185193/2197	19683/125	1055600/28561	112193/1625	601692057/371293	6395006 7/21125
3 Max. motor shaft diameter mm	2	2	2	1.5	2	2	2	2
Part Numbers	118184	134777	134778		134780	118187	134783	134786
1 Reduction	5.4:1	24:1	104:1		455:1	850 :1	1996:1	3728:1
2 Absolute reduction	27/5	1539/65	87723/845		500021/10985	53144/625	285012027/142805	30292137/8125
3 Max. motor shaft diameter mm	1.5	2	2		2	1.5	2	2
Part Numbers		118185	134779		134781		134784	118188
1 Reduction		29:1	128:1		561:1		2458:1	4592:1
2 Absolute reduction		729/25	41553/325		2368521/4225		135005697/54925	14348907/3125
3 Max. motor shaft diameter mm		1.5	2		2		2	1.5
4 Number of stages	1	2	3	3	4	4	5	5
5 Max. continuous torque Nm	0.10	0.15	0.20	0.20	0.25	0.25	0.30	0.30
6 Max. intermittent torque at gear output Nm	0.150	0.225	0.300	0.300	0.375	0.375	0.450	0.450
7 Max. efficiency %	90	81	73	73	65	65	59	59
8 Weight g	20	23	27	27	31	31	35	35
9 Average backlash no load °	1.4	1.6	2.0	2.0	2.4	2.4	3.0	3.0
10 Mass inertia gcm²	0.07	0.05	0.05	0.04	0.05	0.05	0.05	0.05
11 Gearhead length L1 mm	15.5	19.1	22.7	22.7	26.3	26.3	29.9	29.9



maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor/brake) + assembly parts							
RE 16, 2 W	129			37.9	41.5	45.1	45.1	48.7	48.7	52.3	52.3
RE 16, 2 W	129	MR	460/461	43.6	47.2	50.8	50.8	54.4	54.4	58.0	58.0
RE 16, 3.2 W	130/131			56.0	59.6	63.2	63.2	66.8	66.8	70.4	70.4
RE 16, 3.2 W	131	MR	460/461	61.0	64.6	68.2	68.2	71.8	71.8	75.4	75.4
RE 16, 4.5 W	132/133			59.0	62.6	66.2	66.2	69.8	69.8	73.4	73.4
RE 16, 4.5 W	133	MR	460/461	64.0	67.6	71.2	71.2	74.8	74.8	78.4	78.4
A-max 16	149-152			41.0	44.6	48.2	48.2	51.8	51.8	55.4	55.4
A-max 16	150/152	MR	460/461	46.0	49.6	53.2	53.2	56.8	56.8	60.4	60.4
EC-max 16, 5 W	235			39.6	43.2	46.8	46.8	50.4	50.4	54.0	54.0
EC-max 16, 5 W	235	MR	462	46.9	50.5	54.1	54.1	57.7	57.7	61.3	61.3
EC-max 16, 2-wire	236			49.1	52.7	56.3	56.3	59.9	59.9	63.5	63.5

Option Ball Bearing

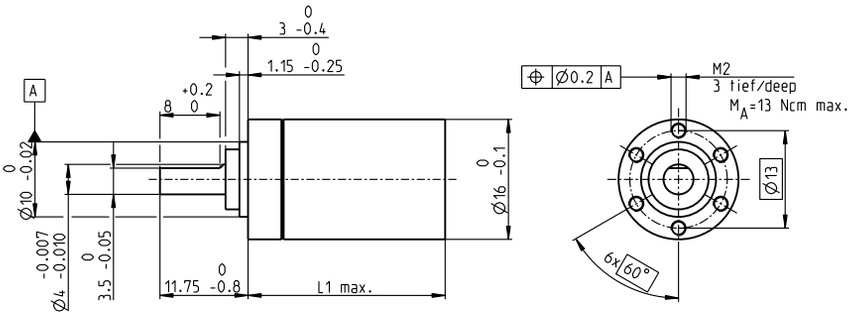


Part Numbers			
4.4 : 1	138333	455 : 1	138343
5.4 : 1	138334	561 : 1	138344
19 : 1	138335	690 : 1	138345
24 : 1	138336	850 : 1	138346
29 : 1	138337	1621 : 1	138347
84 : 1	138338	1996 : 1	138348
104 : 1	138339	2458 : 1	138349
128 : 1	138340	3027 : 1	138350
157 : 1	138341	3728 : 1	138351
370 : 1	138342	4592 : 1	138352

Technical Data	
Planetary Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	preloaded ball bearings
Radial play, 6 mm from flange	max. 0.08 mm
Axial play at axial load	< 4 N 0 mm
	> 4 N max. 0.05 mm
Max. axial load (dynamic)	8 N
Max. force for press fits	25 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-40...+100°C
Number of stages	1 2 3 4 5
Max. radial load, 6 mm from flange	10 N 15 N 20 N 20 N 20 N
Gearhead values according to sleeve bearing version	

Planetary Gearhead GP 16 C ∅16 mm, 0.2–0.6 Nm

Ceramic Version

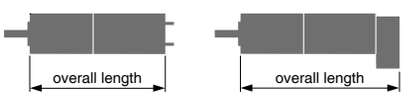


M 1:1

Technical Data						
Planetary Gearhead	straight teeth					
Output shaft	stainless steel, hardened					
Bearing at output	preloaded ball bearings					
Radial play, 6 mm from flange	max. 0.08 mm					
Axial play at axial load	< 4 N	0 mm				
	> 4 N	max. 0.05 mm				
Max. axial load (dynamic)	12 N					
Max. force for press fits	100 N					
Direction of rotation, drive to output	=					
Max. continuous input speed	12 000 rpm					
Recommended temperature range	-40...+100°C					
Number of stages	1	2	3	4	5	
Max. radial load, 6 mm from flange	20 N	40 N	60 N	80 N	80 N	

Stock program
Standard program
Special program (on request)

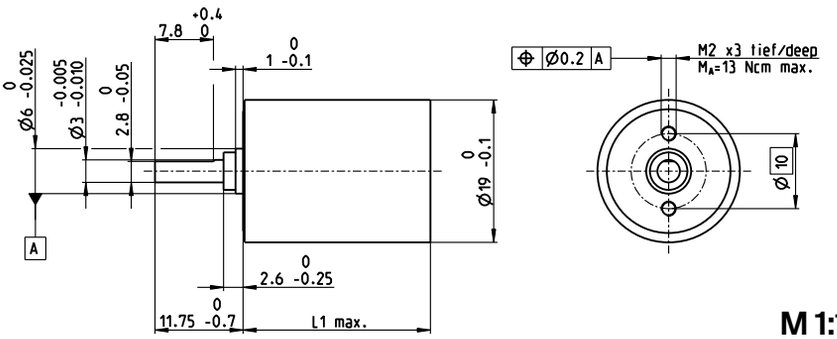
Part Numbers								
	416328	407883	416391	401954	328699	416028	416188	414453
Gearhead Data								
1 Reduction	4.4:1	19:1	84:1	157:1	370:1	690:1	1621:1	3027:1
2 Absolute reduction	$^{57}/_{13}$	$^{3249}/_{169}$	$^{185193}/_{2197}$	$^{19683}/_{125}$	$^{1055600}/_{28561}$	$^{1121931}/_{1625}$	$^{601692057}/_{371293}$	$^{63950067}/_{21125}$
3 Max. motor shaft diameter mm	2	2	2	1.5	2	1.5	2	2
Part Numbers	416500	416499	416385		416115	415807	415893	415476
1 Reduction	5.4:1	24:1	104:1		455:1	850:1	1996:1	3728:1
2 Absolute reduction	$^{27}/_{5}$	$^{1539}/_{65}$	$^{87723}/_{845}$		$^{5000211}/_{10985}$	$^{53144}/_{625}$	$^{285012027}/_{142805}$	$^{30292137}/_{8125}$
3 Max. motor shaft diameter mm	1.5	1.5	2		2	1.5	2	1.5
Part Numbers		416428	402672		416097		415786	409316
1 Reduction		29:1	128:1		561:1		2458:1	4592:1
2 Absolute reduction		$^{729}/_{25}$	$^{41553}/_{325}$		$^{2368521}/_{4225}$		$^{135005697}/_{54925}$	$^{14348907}/_{3125}$
3 Max. motor shaft diameter mm		1.5	1.5		2		2	1.5
4 Number of stages	1	2	3	3	4	4	5	5
5 Max. continuous torque Nm	0.2	0.3	0.4	0.4	0.5	0.5	0.6	0.6
6 Max. intermittent torque at gear output Nm	0.3	0.45	0.6	0.6	0.75	0.75	0.9	0.9
7 Max. efficiency %	90	81	73	73	65	65	59	59
8 Weight g	22	25	29	29	33	33	37	37
9 Average backlash no load °	1.4	1.6	2	2	2.4	2.4	3	3
10 Mass inertia gcm^2	0.07	0.05	0.05	0.04	0.05	0.04	0.05	0.05
11 Gearhead length L1 mm	18.1	23.2	26.8	26.8	30.4	30.4	33.9	33.9



maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor/brake) + assembly parts							
RE 16, 2 W	129			40.5	45.6	49.2	49.2	52.8	52.8	56.3	56.3
RE 16, 2 W	129	MR	460/461	46.2	51.3	54.9	54.9	58.5	58.5	62.0	62.0
RE 16, 3.2 W	130/131			58.6	63.7	67.3	67.3	70.9	70.9	74.4	74.4
RE 16, 3.2 W	131	MR	460/461	63.6	68.7	72.3	72.3	75.9	75.9	79.4	79.4
RE 16, 4.5 W	132/133			61.6	66.7	70.3	70.3	73.9	73.9	77.4	77.4
RE 16, 4.5 W	133	MR	460/461	66.6	71.7	75.3	75.3	78.9	78.9	82.4	82.4
A-max 16	149-152			43.6	48.7	52.3	52.3	55.9	55.9	59.4	59.4
A-max 16	150/152	MR	460/461	48.6	53.7	57.3	57.3	60.9	60.9	64.4	64.4
EC-max 16, 5 W	235			42.2	47.3	50.9	50.9	54.5	54.5	58.0	58.0
EC-max 16, 5 W	235	MR	462	49.5	54.6	58.2	58.2	61.8	61.8	65.3	65.3
EC-max 16, 8 W	237			54.2	59.3	62.9	62.9	66.5	66.5	70.0	70.0
EC-max 16, 8 W	237	MR	462	61.5	66.6	70.2	70.2	73.8	73.8	77.3	77.3

Planetary Gearhead GP 19 B ∅19 mm, 0.1–0.3 Nm



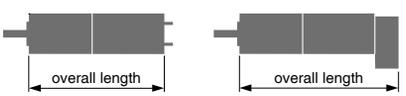
M 1:1

Technical Data					
Planetary Gearhead	straight teeth				
Output shaft	stainless steel, hardened				
Bearing at output	sleeve bearing				
Radial play, 6 mm from flange	max. 0.08 mm				
Axial play	0.02–0.12 mm				
Max. axial load (dynamic)	8 N				
Max. force for press fits	100 N				
Direction of rotation, drive to output	=				
Max. continuous input speed	8000 rpm				
Recommended temperature range	-30...+100°C				
Extended range as option	-40...+100°C				
Number of stages	1	2	3	4	5
Max. radial load, 6 mm from flange	8 N	12 N	16 N	20 N	20 N

gear

Stock program
Standard program
Special program (on request)

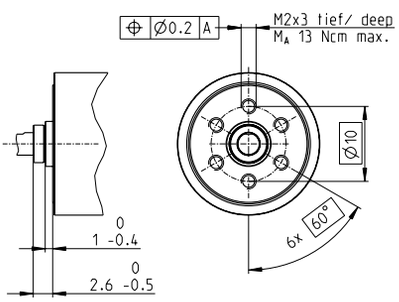
Part Numbers	149039	149041	149044	149047	149048	149051	149053	149056
Gearhead Data								
1 Reduction	4.4:1	19:1	84:1	157:1	370:1	690:1	1621:1	3027:1
2 Absolute reduction	$^{57}/_{13}$	$^{3249}/_{169}$	$^{185193}/_{2197}$	$^{19683}/_{125}$	$^{10556001}/_{28561}$	$^{1121931}/_{1625}$	$^{601692057}/_{371293}$	$^{63950067}/_{21125}$
3 Max. motor shaft diameter mm	2	2	2	1.5	2	2	2	2
Part Numbers	149040	149042	149045		149049	149052	149054	149057
1 Reduction	5.4:1	24:1	104:1		455:1	850 :1	1996:1	3728:1
2 Absolute reduction	$^{27}/_{5}$	$^{1539}/_{65}$	$^{87723}/_{845}$		$^{5000211}/_{10985}$	$^{53144}/_{625}$	$^{285012027}/_{142805}$	$^{30292137}/_{8125}$
3 Max. motor shaft diameter mm	1.5	2	2		2	1.5	2	2
Part Numbers		149043	149046		149050		149055	149058
1 Reduction		29:1	128:1		561:1		2458:1	4592:1
2 Absolute reduction		$^{729}/_{25}$	$^{41553}/_{325}$		$^{2368521}/_{4225}$		$^{135005697}/_{54925}$	$^{14348907}/_{3125}$
3 Max. motor shaft diameter mm		1.5	2		2		2	1.5
4 Number of stages	1	2	3	3	4	4	5	5
5 Max. continuous torque Nm	0.10	0.15	0.20	0.20	0.25	0.25	0.30	0.30
6 Max. intermittent torque at gear output Nm	0.150	0.225	0.300	0.300	0.375	0.375	0.450	0.450
7 Max. efficiency %	90	81	73	73	65	65	59	59
8 Weight g	26	31	36	36	41	41	46	46
9 Average backlash no load °	1.4	1.6	2.0	2.0	2.4	2.4	3.0	3.0
10 Mass inertia gcm^2	0.07	0.05	0.05	0.05	0.05	0.05	0.05	0.05
11 Gearhead length L1 mm	15.9	19.5	23.1	23.1	26.7	26.7	30.3	30.3



maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor/brake) + assembly parts							
A-max 19	153/154			44.9	48.5	52.1	52.1	55.7	55.7	59.3	59.3
A-max 19, 1.5 W	154	MR	460/461	50.0	53.6	57.2	57.2	60.8	60.8	64.4	64.4
A-max 19, 1.5 W	154	Enc 22	468	59.3	62.9	66.5	66.5	70.1	70.1	73.7	73.7
A-max 19, 2.5 W	155/156			47.5	51.1	54.7	54.7	58.3	58.3	61.9	61.9
A-max 19, 2.5 W	156	MR	460/461	51.8	55.4	59.0	59.0	62.6	62.6	66.2	66.2
A-max 19, 2.5 W	156	Enc 22	468	61.9	65.5	69.1	69.1	72.7	72.7	76.3	76.3

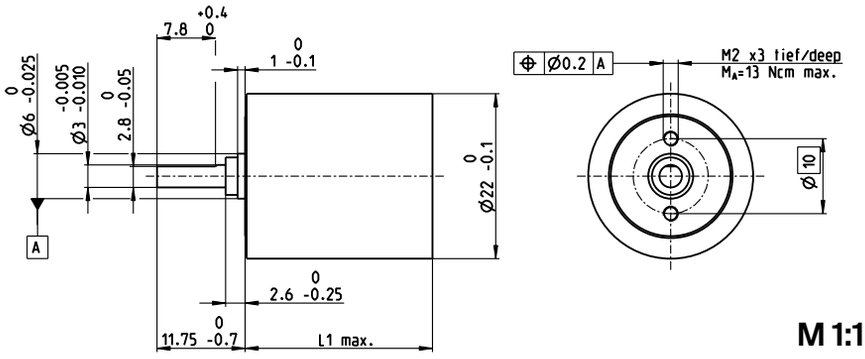
Option Ball Bearing



Part Numbers			
4.4 : 1	227632	455 : 1	227642
5.4 : 1	227633	561 : 1	227643
19 : 1	227634	690 : 1	227644
24 : 1	227635	850 : 1	227645
29 : 1	227636	1621 : 1	227646
84 : 1	227637	1996 : 1	227647
104 : 1	227638	2458 : 1	227648
128 : 1	227639	3027 : 1	227649
157 : 1	227640	3728 : 1	227650
370 : 1	227641	4592 : 1	227651

Technical Data					
Planetary Gearhead	straight teeth				
Output shaft	stainless steel, hardened				
Bearing at output	preloaded ball bearings				
Radial play, 6 mm from flange	max. 0.08 mm				
Axial play at axial load	< 4 N	0 mm			
	> 4 N	max. 0.05 mm			
Max. axial load (dynamic)	8 N				
Max. force for press fits	25 N				
Direction of rotation, drive to output	=				
Max. continuous input speed	8000 rpm				
Recommended temperature range	-40...+100°C				
Number of stages	1	2	3	4	5
Max. radial load, 6 mm from flange	10 N	15 N	20 N	20 N	20 N
Gearhead values according to sleeve bearing version					

Planetary Gearhead GP 22 B ∅22 mm, 0.1–0.3 Nm

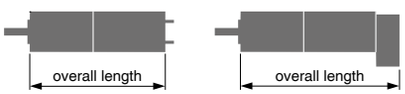


M 1:1

Technical Data					
Planetary Gearhead	straight teeth				
Housing	steel				
Output shaft	stainless steel, hardened				
Bearing at output	sleeve bearing				
Radial play, 6 mm from flange	max. 0.06 mm				
Axial play	0.02–0.10 mm				
Max. axial load (dynamic)	8 N				
Max. force for press fits	100 N				
Direction of rotation, drive to output	=				
Max. continuous input speed	8000 rpm				
Recommended temperature range	-30...+100°C				
Extended range as option	-40...+100°C				
Number of stages	1	2	3	4	5
Max. radial load, 6 mm from flange	8 N	12 N	16 N	20 N	20 N

Stock program
Standard program
Special program (on request)

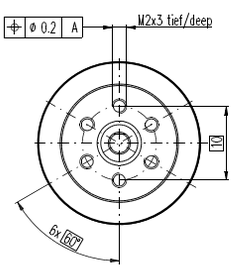
Part Numbers	110355	110356	110357	118653	110358	134772	110359	134775
Gearhead Data								
1 Reduction	4.4:1	19:1	84:1	157:1	370:1	690:1	1621:1	3027:1
2 Absolute reduction	57/13	3249/169	185193/2197	19683/125	10556001/28561	112193/1625	601692057/371293	63950067/21125
3 Max. motor shaft diameter mm	2	2	2	1.5	2	2	2	2
Part Numbers	118651	134767	134768		134770	118654	134773	134776
1 Reduction	5.4:1	24:1	104:1		455:1	850:1	1996:1	3728:1
2 Absolute reduction	27/5	1539/65	87723/845		5000211/10985	53144/625	285012027/142805	30292137/8125
3 Max. motor shaft diameter mm	1.5	2	2		2	1.5	2	2
Part Numbers		118652	134769		134771		134774	118655
1 Reduction		29:1	128:1		561:1		2458:1	4592:1
2 Absolute reduction		729/25	41553/325		2368521/4225		135005697/54925	14348907/3125
3 Max. motor shaft diameter mm		1.5	2		2		2	1.5
4 Number of stages	1	2	3	3	4	4	5	5
5 Max. continuous torque Nm	0.10	0.15	0.20	0.20	0.25	0.25	0.30	0.30
6 Max. intermittent torque at gear output Nm	0.150	0.225	0.300	0.300	0.375	0.375	0.450	0.450
7 Max. efficiency %	90	81	73	73	65	65	59	59
8 Weight g	39	48	57	57	65	65	73	73
9 Average backlash no load °	1.4	1.6	2.0	2.0	2.4	2.4	3.0	3.0
10 Mass inertia gcm²	0.07	0.05	0.05	0.05	0.05	0.05	0.05	0.05
11 Gearhead length L1 mm	15.9	19.5	23.1	23.1	26.7	26.7	30.3	30.3



maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor/brake) + assembly parts							
A-max 22	157-160			47.9	51.5	55.1	55.1	58.7	58.7	62.3	62.3
A-max 22	158/160	MR	460/461	52.9	56.5	60.1	60.1	63.7	63.7	67.3	67.3
A-max 22	158/160	Enc 22	468	62.3	65.9	69.5	69.5	73.1	73.1	76.7	76.7

Option Ball Bearing

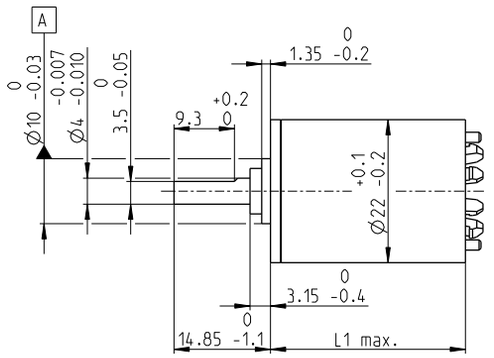


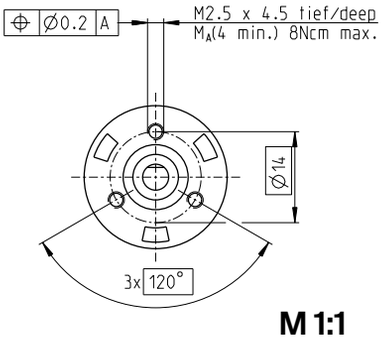
Part Numbers			
4.4 : 1	144137	455 : 1	144147
5.4 : 1	144138	561 : 1	144148
19 : 1	144139	690 : 1	144149
24 : 1	144140	850 : 1	144150
29 : 1	144141	1621 : 1	144151
84 : 1	144142	1996 : 1	144152
104 : 1	144143	2458 : 1	144153
128 : 1	144144	3027 : 1	144154
157 : 1	144145	3728 : 1	144155
370 : 1	144146	4592 : 1	144156

Technical Data					
Planetary Gearhead	straight teeth				
Housing	steel				
Output shaft	stainless steel, hardened				
Bearing at output	preloaded ball bearings				
Radial play, 6 mm from flange	max. 0.08 mm				
Axial play at axial load	< 4 N	0 mm			
	> 4 N	max. 0.05 mm			
Max. axial load (dynamic)	8 N				
Max. force for press fits	25 N				
Direction of rotation, drive to output	=				
Max. continuous input speed	8000 rpm				
Recommended temperature range	-40...+100°C				
Number of stages	1	2	3	4	5
Max. radial load, 6 mm from flange	10 N	15 N	20 N	20 N	20 N
Gearhead values according to sleeve bearing version					

Planetary Gearhead GP 22 L ∅22 mm, 0.2–0.6 Nm

Plastic Version



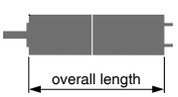


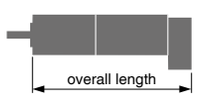
M 1:1

Technical Data					
Planetary Gearhead	straight teeth				
Housing	plastic				
Output shaft	stainless steel, hardened				
Bearing at output	sleeve bearing				
Radial play, 10 mm from flange	max. 0.1 mm				
Axial play	max. 0.15 mm				
Max. axial load (dynamic)	20 N				
Max. force for press fits	100 N				
Direction of rotation, drive to output	=				
Max. continuous input speed	6000 rpm				
Recommended temperature range	-15...+80°C				
Number of stages	1	2	3	4	5
Max. radial load, 10 mm from flange	15 N	20 N	25 N	30 N	30 N

Stock program
Standard program
Special program (on request)

Gearhead Data			Part Numbers									
			232763	232766	232772	232778	232782	232788	232794	232796	232803	232809	232815
1	Reduction		3.8:1	14:1	53:1	104:1	198:1	370:1	590:1	742:1	1386:1	1996:1	3189:1
2	Absolute reduction		15/4	225/16	3375/64	87723/845	50625/256	1055001/28561	59049/100	759375/1024	158340015/114244	28501202/142805	1594323/500
3	Max. motor shaft diameter	mm	4	4	4	3.2	4	3.2	4	4	3.2	3.2	4
	Part Numbers		232764	232767	232773	232779	232783	232789	232795	232798	232804	232810	232816
1	Reduction		4.4 :1	16:1	62:1	109:1	231:1	389:1	690:1	867:1	1460:1	2102:1	3728:1
2	Absolute reduction		57/13	855/52	12825/208	2187/20	192375/832	263169/676	1121931/1625	2885625/3328	3947535/2704	7105563/3380	30292137/8125
3	Max. motor shaft diameter	mm	3.2	3.2	3.2	4	3.2	3.2	3.2	3.2	3.2	3.2	3.2
	Part Numbers		232765	232768	232774	232780	232784	232790	232797	232799	232805	232811	232817
1	Reduction		5.4:1	19:1	72:1	128:1	270:1	410:1	850:1	1014:1	1538:1	2214:1	4592:1
2	Absolute reduction		27/5	3249/169	48735/676	41553/325	731025/2704	6561/16	531441/625	10965375/10816	98415/64	177147/80	14348907/3125
3	Max. motor shaft diameter	mm	2.5	3.2	3.2	3.2	3.2	4	2.5	3.2	4	4	2.5
	Part Numbers			232769	232775	232781	232785	232791		232800	232806	232812	
1	Reduction			20:1	76:1	157:1	285:1	455:1		1068:1	1621:1	2458:1	
2	Absolute reduction			81/4	1215/16	19683/125	18225/64	5000211/10985		273375/256	60169205/371293	135005697/54925	
3	Max. motor shaft diameter	mm		4	4	2.5	4	3.2		4	3.2	3.2	
	Part Numbers			232770	232776		232786	232792		232801	232807	232813	
1	Reduction			24:1	84:1		316:1	479:1		1185:1	1707:1	2589:1	
2	Absolute reduction			1539/65	185193/2197		2777895/8788	124659/260		41668425/35152	15000633/8788	3365793/1300	
3	Max. motor shaft diameter	mm		3.2	3.2		3.2	3.2		3.2	3.2	3.2	
	Part Numbers			232771	232777		232787	232793		232802	232808	232814	
1	Reduction			29:1	89:1		333:1	561:1		1249:1	1798:1	3027:1	
2	Absolute reduction			729/25	4617/52		69255/208	2368521/4225		1038825/832	373977/208	63950067/21125	
3	Max. motor shaft diameter	mm		2.5	3.2		3.2	3.2		3.2	3.2	3.2	
4	Number of stages		1	2	3	3	4	4	4	5	5	5	5
5	Max. continuous torque	Nm	0.2	0.3	0.4	0.4	0.5	0.5	0.5	0.6	0.6	0.6	0.6
6	Max. intermittent torque at gear output	Nm	0.3	0.4	0.5	0.5	0.7	0.7	0.7	0.8	0.8	0.8	0.8
7	Max. efficiency	%	84	70	59	59	49	49	49	42	42	42	42
8	Weight	g	28	35	43	43	51	51	51	59	59	59	59
9	Average backlash no load	°	1.0	1.2	1.6	1.6	2.0	2.0	2.0	2.0	2.0	2.0	2.0
10	Mass inertia	gcm²	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
11	Gearhead length L1	mm	22.7	29.5	36.3	36.3	43.1	43.1	43.1	49.9	49.9	49.9	49.9

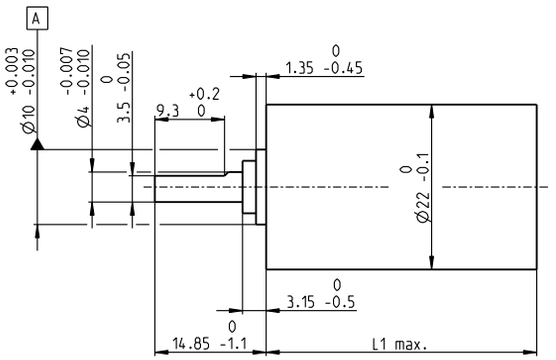


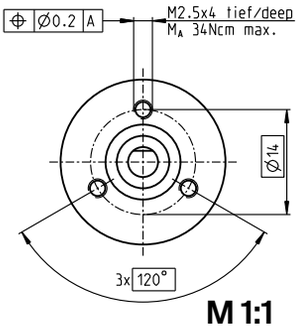


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts										
A-max 22	157-160			54.7	61.5	68.3	68.3	75.1	75.1	75.1	81.9	81.9	81.9	81.9
A-max 22	158/160	MR	460/461	59.7	66.5	73.3	73.3	80.1	80.1	80.1	86.9	86.9	86.9	86.9
A-max 22	158/160	Enc 22	468	69.1	75.9	82.7	82.7	89.5	89.5	89.5	96.3	96.3	96.3	96.3

Planetary Gearhead GP 22 A ∅22 mm, 0.5–1.0 Nm





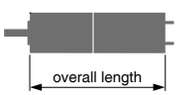
M 1:1

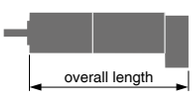
Technical Data					
Planetary Gearhead	straight teeth				
Output shaft	stainless steel, hardened				
Bearing at output	ball bearing				
Option	sleeve bearing				
Radial play, 10 mm from flange	max. 0.2 mm				
Axial play	max. 0.2 mm				
Max. axial load (dynamic)	100 N				
Max. force for press fits	100 N				
Direction of rotation, drive to output	=				
Max. continuous input speed	6000 rpm				
Recommended temperature range	-40...+100°C				
Number of stages	1	2	3	4	5
Max. radial load, 10 mm from flange	30 N	50 N	55 N	55 N	55 N

Stock program
Standard program
Special program (on request)

Part Numbers											
	134156	134158	134163	134168	134172	110340	134183	134186	134190	134195	134203
Gearhead Data											
1 Reduction	3.8:1	14:1	53:1	104:1	198:1	370:1	590:1	742:1	1386:1	1996:1	3189:1
2 Absolute reduction	15/4	225/16	3375/64	87723/845	50625/256	10556001/28561	59049/100	759375/1024	158340015/114244	28501202?/142805	1594323/500
3 Max. motor shaft diameter mm	4	4	4	3.2	4	3.2	4	4	3.2	3.2	4
Part Numbers	110337	134159	134164	134169	134173	134178	134184	134187	134193	134198	134204
1 Reduction	4.4 :1	16:1	62:1	109:1	231:1	389:1	690:1	867:1	1460:1	2102:1	3728:1
2 Absolute reduction	57/13	855/52	12825/208	2187/20	192375/832	263169/676	1121931/1625	2885625/3328	3947535/2704	7105563/3380	30292137/8125
3 Max. motor shaft diameter mm	3.2	3.2	3.2	4	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Part Numbers	134157	110338	134165	**134170**	134174	134180	134185	134188	134196	134200	134205
1 Reduction	5.4:1	19:1	72:1	128:1	270:1	410:1	850:1	1014:1	1538:1	2214:1	4592:1
2 Absolute reduction	27/5	3249/169	48735/676	41553/325	731025/2704	6561/16	531441/625	10965375/10816	98415/64	177147/80	14348907/3125
3 Max. motor shaft diameter mm	2.5	3.2	3.2	3.2	3.2	4	2.5	3.2	4	4	2.5
Part Numbers		134160	134166	134171	134176	134179		134191	110341	134199	
1 Reduction		20:1	76:1	157:1	285:1	455:1		1068:1	1621:1	2458:1	
2 Absolute reduction		81/4	1215/16	19683/125	18225/64	5000211/10985		273375/256	60169205?/371293	135005697/54925	
3 Max. motor shaft diameter mm		4	4	2.5	4	3.2		4	3.2	3.2	
Part Numbers		134161	**110339**		134175	134181		134189	134194	134201	
1 Reduction		24:1	84:1		316:1	479:1		1185:1	1707:1	2589:1	
2 Absolute reduction		1539/65	185193/2197		2777895/8788	124659/260		41668425/35152	15000633/8788	3365793/1300	
3 Max. motor shaft diameter mm		3.2	3.2		3.2	3.2		3.2	3.2	3.2	
Part Numbers		134162	134167		134177	134182		134192	134197	134202	
1 Reduction		29:1	89:1		333:1	561:1		1249:1	1798:1	3027:1	
2 Absolute reduction		729/25	4617/52		69255/208	2368521/4225		1038825/832	373977/208	63950067/21125	
3 Max. motor shaft diameter mm		2.5	3.2		3.2	3.2		3.2	3.2	3.2	
4 Number of stages	1	2	3	3	4	4	4	5	5	5	5
5 Max. continuous torque Nm	0.5	0.5	0.8	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0
6 Max. intermittent torque at gear output Nm	0.8	0.8	1.2	1.2	1.6	1.6	1.6	1.6	1.6	1.6	1.6
7 Max. efficiency %	84	70	59	59	49	49	49	42	42	42	42
8 Weight g	42	55	68	68	81	81	81	94	94	94	94
9 Average backlash no load °	1.0	1.2	1.6	1.6	2.0	2.0	2.0	2.0	2.0	2.0	2.0
10 Mass inertia gcm²	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
11 Gearhead length L1* mm	22.6	29.4	36.2	36.2	43.0	43.0	43.0	49.8	49.8	49.8	49.8

*for EC 32fl. L1 is + 7.1 mm



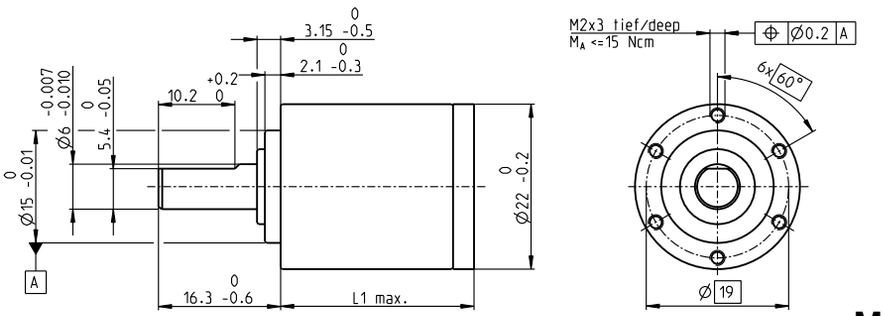


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts										
A-max 19, 1.5 W	154	MR	460/461	56.7	63.5	70.3	70.3	77.1	77.1	77.1	83.9	83.9	83.9	83.9
A-max 19, 1.5 W	154	Enc 22	468	66.0	72.8	79.6	79.6	86.4	86.4	86.4	93.2	93.2	93.2	93.2
A-max 19, 2.5 W	155/156			54.2	61.0	67.8	67.8	74.6	74.6	74.6	81.4	81.4	81.4	81.4
A-max 19, 2.5 W	156	MR	460/461	58.5	65.3	72.1	72.1	78.9	78.9	78.9	85.7	85.7	85.7	85.7
A-max 19, 2.5 W	156	Enc 22	468	68.6	75.4	82.2	82.2	89.0	89.0	89.0	95.8	95.8	95.8	95.8
A-max 22	157-160			54.6	61.4	68.2	68.2	75.0	75.0	75.0	81.8	81.8	81.8	81.8
A-max 22	158/160	MR	460/461	59.6	66.4	73.2	73.2	80.0	80.0	80.0	86.8	86.8	86.8	86.8
A-max 22	158/160	Enc 22	468	69.0	75.8	82.6	82.6	89.4	89.4	89.4	96.2	96.2	96.2	96.2
EC 20 flat, 3 W, A	277			33.1	39.9	46.7	46.7	53.5	53.5	53.5	60.3	60.3	60.3	60.3
EC 20 flat, 3 W, B	277			32.5	39.3	46.1	46.1	52.9	52.9	52.9	59.7	59.7	59.7	59.7
EC 20 flat, 5 W	278			36.7	43.5	50.3	50.3	57.1	57.1	57.1	63.9	63.9	63.9	63.9
EC 20 flat, IE, IP 00	279			39.7	46.5	53.3	53.3	60.1	60.1	60.1	66.9	66.9	66.9	66.9
EC 20 flat, IE, IP 40	279			40.8	47.6	54.4	54.4	61.2	61.2	61.2	68.0	68.0	68.0	68.0
EC 20 flat, IE, IP 00	280			43.7	50.5	57.3	57.3	64.1	64.1	64.1	70.9	70.9	70.9	70.9
EC 20 flat, IE, IP 40	280			44.8	51.6	58.4	58.4	65.2	65.2	65.2	72.0	72.0	72.0	72.0
EC 32 flat, 6 W	281			39.8	46.6	53.4	53.4	60.2	60.2	60.2	67.0	67.0	67.0	67.0

Planetary Gearhead GP 22 AR ∅22 mm, 0.50 Nm

for high radial loads



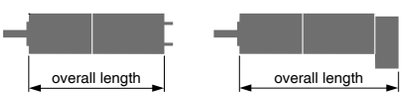
M 1:1

Technical Data	
Planetary Gearhead	straight teeth
Output shaft	stainless steel
Bearing at output	ball bearing
Radial play, 10 mm from flange	max. 0.2 mm
Axial play	max. 0.1 mm
Max. axial load (dynamic)	100 N
Max. force for press fits	100 N
Direction of rotation, drive to output	=
Max. continuous input speed	6 000 rpm
Recommended temperature range	-30...+100°C
Max. radial load, 10 mm from flange	70 N

gear

Stock program
Standard program
Special program (on request)

Gearhead Data		Part Numbers		
		462695	438992	462696
1 Reduction		3.8:1	4.4:1	5.4:1
2 Absolute reduction		15/4	57/13	27/5
3 Max. motor shaft diameter	mm	4	3.2	2.5
4 Number of stages		1	1	1
5 Max. continuous torque	Nm	0.5	0.5	0.5
6 Max. intermittent torque at gear output	Nm	0.8	0.8	0.8
7 Max. efficiency	%	90	90	90
8 Weight	g	44	44	44
9 Average backlash no load	°	1.0	1.0	1.0
10 Mass inertia	gcm²	0.5	0.38	0.25
11 Gearhead length L1	mm	25.8	25.8	25.8

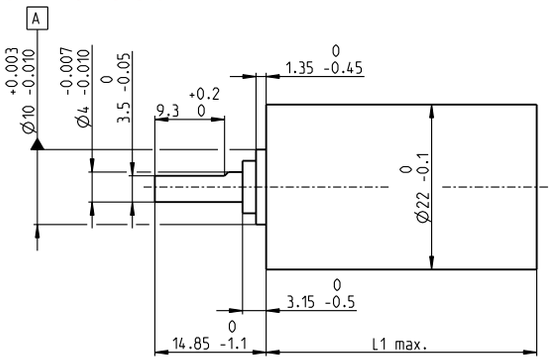


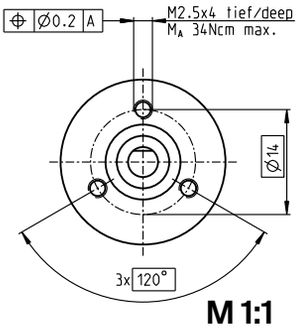
maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor/brake) + assembly parts		
RE 25, 20 W	135			68.9	68.9	68.9
RE 25, 20 W	135	MR	463	79.9	79.9	79.9
RE 25, 20 W	135	HED_ 5540	472/473	89.7	89.7	89.7
RE 25, 20 W	135	DCT 22	480	91.2	91.2	91.2
RE 25, 20 W	135	AB 28	519	103	103	103
RE 25, 20 W	135	HED_ 5540/AB 28	472/519	120.2	120.2	120.2
EC-max 22, 25 W	239			74.4	74.4	74.4
EC-max 22, 25 W	239	MR	462	84	84	84
EC-max 22, 25 W	239	AB 20	516	110	110	110

Planetary Gearhead GP 22 C ∅22 mm, 0.5–2.0 Nm

Ceramic Version





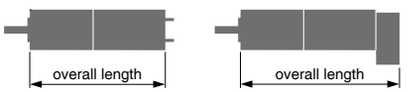
M 1:1

Technical Data						
Planetary Gearhead	straight teeth					
Output shaft	stainless steel, hardened					
Bearing at output	ball bearing					
Radial play, 10 mm from flange	max. 0.2 mm					
Axial play	max. 0.2 mm					
Max. axial load (dynamic)	100 N					
Max. force for press fits	100 N					
Direction of rotation, drive to output	=					
Max. continuous input speed	8000 rpm					
Recommended temperature range	-40...+100°C					
Number of stages	1	2	3	4	5	
Max. radial load, 10 mm from flange	30 N	50 N	55 N	55 N	55 N	

Stock program
Standard program
Special program (on request)

Part Numbers	143971	143974	143980	143986	143990	143996	144002	144004	144011	144017	144023
Gearhead Data											
1 Reduction	3.8:1	14:1	53:1	104:1	198:1	370:1	590:1	742:1	1386:1	1996:1	3189:1
2 Absolute reduction	15/4	225/16	3375/64	87723/845	50625/256	1055600/28561	59049/100	759375/1024	15834015/114244	28501227/142805	1594323/500
3 Max. motor shaft diameter mm	4	4	4	3.2	4	3.2	4	4	3.2	3.2	4
Part Numbers	143972	143975	143981	143987	143991	143997	144003	144006	144012	144018	144024
1 Reduction	4.4 :1	16:1	62:1	109:1	231:1	389:1	690:1	867:1	1460:1	2102:1	3728:1
2 Absolute reduction	57/13	855/52	12825/208	2187/20	192375/832	263169/676	1121931/1625	2885625/3328	3947535/2704	7105563/3380	30292137/8125
3 Max. motor shaft diameter mm	3.2	3.2	3.2	4	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Part Numbers	143973	143976	143982	**143988**	143992	143998	144005	144007	144013	144019	144025
1 Reduction	5.4:1	19:1	72:1	128:1	270:1	410:1	850:1	1014:1	1538:1	2214:1	4592:1
2 Absolute reduction	27/5	3249/169	48735/676	41553/325	731025/2704	6561/16	531441/625	10965375/10816	98415/64	177147/80	14348907/3125
3 Max. motor shaft diameter mm	2.5	3.2	3.2	3.2	3.2	4	2.5	3.2	4	4	2.5
Part Numbers		143977	143983	143989	143993	143999		144008	144014	144020	
1 Reduction		20:1	76:1	157:1	285:1	455:1		1068:1	1621:1	2458:1	
2 Absolute reduction		81/4	1215/16	19683/125	18225/64	5000211/10985		273375/256	60169205/371293	135005697/54925	
3 Max. motor shaft diameter mm		4	4	2.5	4	3.2		4	3.2	3.2	
Part Numbers		143978	**143984**		143994	144000		144009	144015	144021	
1 Reduction		24:1	84:1		316:1	479:1		1185:1	1707:1	2589:1	
2 Absolute reduction		1539/65	185193/2197		2777895/8788	124659/260		41668425/35152	15000633/8788	3365793/1300	
3 Max. motor shaft diameter mm		3.2	3.2		3.2	3.2		3.2	3.2	3.2	
Part Numbers		143979	143985		143995	144001		144010	144016	144022	
1 Reduction		29:1	89:1		333:1	561:1		1249:1	1798:1	3027:1	
2 Absolute reduction		729/25	4617/52		69255/208	236852/4225		1038825/832	373977/208	63950067/21125	
3 Max. motor shaft diameter mm		2.5	3.2		3.2	3.2		3.2	3.2	3.2	
4 Number of stages	1	2	3	3	4	4	4	5	5	5	5
5 Max. continuous torque Nm	0.5	0.6	1.2	1.2	1.8	1.8	1.8	2.0	2.0	2.0	2.0
6 Max. intermittent torque at gear output Nm	0.8	0.9	1.9	1.9	2.7	2.7	2.7	3.0	3.0	3.0	3.0
7 Max. efficiency %	84	70	59	59	49	49	49	42	42	42	42
8 Weight g	42	55	68	68	81	81	81	94	94	94	94
9 Average backlash no load °	1.0	1.2	1.6	1.6	2.0	2.0	2.0	2.0	2.0	2.0	2.0
10 Mass inertia gcm²	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
11 Gearhead length L1* mm	25.4	32.2	39.0	39.0	45.8	45.8	45.8	52.6	52.6	52.6	52.6

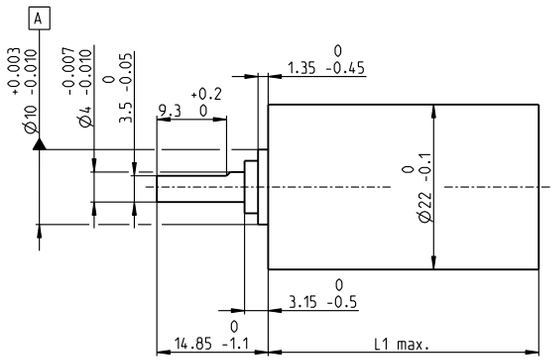
*L1 is–2.8 mm for calculating the overall length

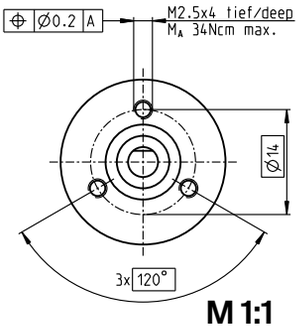


maxon Modular System												
+ Motor	Page	+ Sensor/Brake	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor/brake) + assembly parts										
A-max 19	153/154			51.6	58.4	65.2	65.2	72.0	72.0	72.0	78.8	78.8	78.8	78.8
A-max 19, 1.5 W	154	MR	460/461	56.7	63.5	70.3	70.3	77.1	77.1	77.1	83.9	83.9	83.9	83.9
A-max 19, 1.5 W	154	Enc 22	468	66.0	72.8	79.6	79.6	86.4	86.4	86.4	93.2	93.2	93.2	93.2
A-max 19, 2.5 W	155/156			54.2	61.0	67.8	67.8	74.6	74.6	74.6	81.4	81.4	81.4	81.4
A-max 19, 2.5 W	156	MR	460/461	58.5	65.3	72.1	72.1	78.9	78.9	78.9	85.7	85.7	85.7	85.7
A-max 19, 2.5 W	156	Enc 22	468	68.6	75.4	82.2	82.2	89.0	89.0	89.0	95.8	95.8	95.8	95.8
A-max 22	157-160			54.6	61.4	68.2	68.2	75.0	75.0	75.0	81.8	81.8	81.8	81.8
A-max 22	158/160	MR	460/461	59.6	66.4	73.2	73.2	80.0	80.0	80.0	86.8	86.8	86.8	86.8
A-max 22	158/160	Enc 22	468	69.0	75.8	82.6	82.6	89.4	89.4	89.4	96.2	96.2	96.2	96.2

Planetary Gearhead GP 22 C ∅22 mm, 0.5–2.0 Nm

Ceramic Version





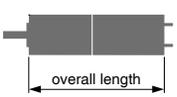
M 1:1

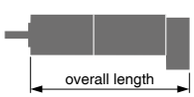
Technical Data						
Planetary Gearhead						straight teeth
Output shaft						stainless steel, hardened
Bearing at output						ball bearing
Radial play, 10 mm from flange						max. 0.2 mm
Axial play						max. 0.2 mm
Max. axial load (dynamic)						100 N
Max. force for press fits						100 N
Direction of rotation, drive to output						=
Max. continuous input speed						8000 rpm
Recommended temperature range						-40...+100°C
Number of stages	1	2	3	4	5	
Max. radial load, 10 mm from flange	30 N	50 N	55 N	55 N	55 N	

Stock program
Standard program
Special program (on request)

Part Numbers	143971	143974	143980	143986	143990	143996	144002	144004	144011	144017	144023
Gearhead Data											
1 Reduction	3.8:1	14:1	53:1	104:1	198:1	370:1	590:1	742:1	1386:1	1996:1	3189:1
2 Absolute reduction	15/4	225/16	3375/64	87723/845	50625/256	1055600/28561	59049/100	759375/1024	158340015/114244	285012027/142805	1594323/500
3 Max. motor shaft diameter mm	4	4	4	3.2	4	3.2	4	4	3.2	3.2	4
Part Numbers	**143972**	143975	143981	143987	**143991**	143997	**144003**	144006	144012	144018	144024
1 Reduction	4.4 :1	16:1	62:1	109:1	231:1	389:1	690:1	867:1	1460:1	2102:1	3728:1
2 Absolute reduction	57/13	855/52	12825/208	2187/20	192375/832	263169/676	1121931/1625	2885625/3328	3947535/2704	7105563/3380	30292137/8125
3 Max. motor shaft diameter mm	3.2	3.2	3.2	4	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Part Numbers	143973	**143976**	143982	**143988**	143992	143998	144005	144007	144013	144019	144025
1 Reduction	5.4:1	19:1	72:1	128:1	270:1	410:1	850:1	1014:1	1538:1	2214:1	4592:1
2 Absolute reduction	27/5	3249/169	48735/676	41553/325	731025/2704	6561/16	531441/625	10965375/10816	98415/64	177147/80	14348907/3125
3 Max. motor shaft diameter mm	2.5	3.2	3.2	3.2	3.2	4	2.5	3.2	4	4	2.5
Part Numbers		143977	143983	143989	143993	143999		144008	144014	144020	
1 Reduction		20:1	76:1	157:1	285:1	455:1		1068:1	1621:1	2458:1	
2 Absolute reduction		81/4	1215/16	19683/125	18225/64	5000211/10985		273375/256	60169205/371293	135005697/54925	
3 Max. motor shaft diameter mm		4	4	2.5	4	3.2		4	3.2	3.2	
Part Numbers		143978	**143984**		143994	144000		144009	144015	144021	
1 Reduction		24:1	84:1		316:1	479:1		1185:1	1707:1	2589:1	
2 Absolute reduction		1539/65	185193/2197		2777895/6788	124659/260		41668425/35152	15000633/8788	3365793/1300	
3 Max. motor shaft diameter mm		3.2	3.2		3.2	3.2		3.2	3.2	3.2	
Part Numbers		143979	143985		143995	144001		144010	144016	144022	
1 Reduction		29:1	89:1		333:1	561:1		1249:1	1798:1	3027:1	
2 Absolute reduction		729/25	4617/52		69255/208	2368521/4225		1038825/832	373977/208	63950067/21125	
3 Max. motor shaft diameter mm		2.5	3.2		3.2	3.2		3.2	3.2	3.2	
4 Number of stages	1	2	3	3	4	4	4	5	5	5	5
5 Max. continuous torque Nm	0.5	0.6	1.2	1.2	1.8	1.8	1.8	2.0	2.0	2.0	2.0
6 Max. intermittent torque at gear output Nm	0.8	0.9	1.9	1.9	2.7	2.7	2.7	3.0	3.0	3.0	3.0
7 Max. efficiency %	84	70	59	59	49	49	49	42	42	42	42
8 Weight g	42	55	68	68	81	81	81	94	94	94	94
9 Average backlash no load °	1.0	1.2	1.6	1.6	2.0	2.0	2.0	2.0	2.0	2.0	2.0
10 Mass inertia gcm²	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
11 Gearhead length L1* mm	25.4	32.2	39.0	39.0	45.8	45.8	45.8	52.6	52.6	52.6	52.6

*for EC-max 16 L1 is–2.8 mm



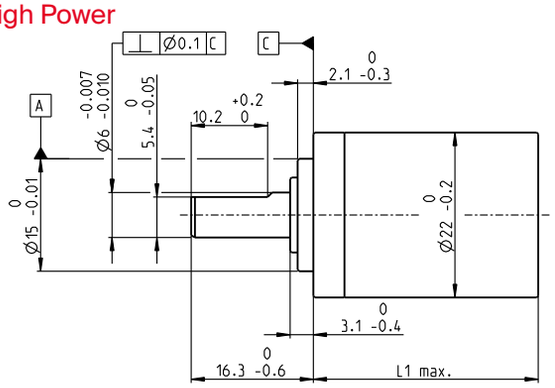


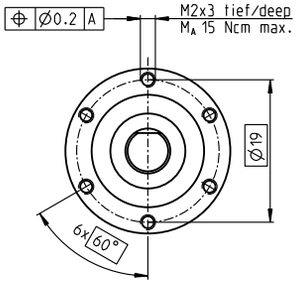
maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts										
EC-max 16, 8 W	237			58.7	65.5	72.3	72.3	79.1	79.1	79.1	85.9	85.9	85.9	85.9
EC-max 16, 8 W	237	MR	462	66.0	72.8	79.6	79.6	86.4	86.4	86.4	93.2	93.2	93.2	93.2
EC-max 22, 12 W	238			57.5	64.3	71.1	71.1	77.9	77.9	77.9	84.7	84.7	84.7	84.7
EC-max 22, 12 W	238	MR	462	67.2	74.0	80.8	80.8	87.6	87.6	87.6	94.4	94.4	94.4	94.4
EC-max 22, 12 W	238	AB 20	516	93.1	99.9	106.7	106.7	113.5	113.5	113.5	120.3	120.3	120.3	120.3
EC 20 flat, 3 W, A	277			33.1	39.9	46.7	46.7	53.5	53.5	53.5	60.3	60.3	60.3	60.3
EC 20 flat, 3 W, B	277			32.5	39.3	46.1	46.1	52.9	52.9	52.9	59.7	59.7	59.7	59.7
EC 20 flat, 5 W	278			36.7	43.5	50.3	50.3	57.1	57.1	57.1	63.9	63.9	63.9	63.9
EC 20 flat, IE, IP 00	279			39.7	46.5	53.3	53.3	60.1	60.1	60.1	66.9	66.9	66.9	66.9
EC 20 flat, IE, IP 40	279			40.8	47.6	54.4	54.4	61.2	61.2	61.2	68.0	68.0	68.0	68.0
EC 20 flat, IE, IP 00	280			43.7	50.5	57.3	57.3	64.1	64.1	64.1	70.9	70.9	70.9	70.9
EC 20 flat, IE, IP 40	280			44.8	51.6	58.4	58.4	65.2	65.2	65.2	72.0	72.0	72.0	72.0
EC 32 flat, 6 W	281			39.8	46.6	53.4	53.4	60.2	60.2	60.2	67.0	67.0	67.0	67.0

Planetary Gearhead GP 22 HP ∅22 mm, 2.0–3.4 Nm

High Power



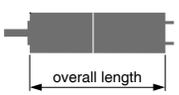


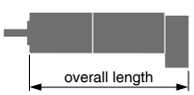
M 1:1

Technical Data				
Planetary Gearhead	straight teeth			
Output shaft	stainless steel, hardened			
Bearing at output	ball bearing			
Radial play, 10 mm from flange	max. 0.2 mm			
Axial play	max. 0.1 mm			
Max. axial load (dynamic)	100 N			
Max. force for press fits	100 N			
Direction of rotation, drive to output	=			
Max. continuous input speed	12000 rpm			
Recommended temperature range	-40...+100°C			
Number of stages	1	2	3	4
Max. radial load, 10 mm from flange	55 N	85 N	100 N	110 N

Stock program
Standard program
Special program (on request)

Gearhead Data (provisional)											
Part Numbers		370683	370687	370690	**370776**	370780	370783	370792	370797	370802	370807
1 Reduction		3.8:1	14:1	20:1	53:1	76:1	104:1	198:1	316:1	410:1	590:1
2 Absolute reduction		15/4	225/16	81/4	3375/64	1215/16	87723/845	50625/256	2777895/8788	6561/16	59049/100
3 Max. motor shaft diameter	mm	4	4	4	4	4	3.2	4	3.2	4	4
Part Numbers		370685	370688	370691	370778	370781	370784	370794	370799	370803	370808
1 Reduction		4.4:1	16:1	24:1	62:1	84:1	109:1	231:1	333:1	455:1	690:1
2 Absolute reduction		57/13	855/52	1539/65	12825/208	185193/2197	2187/20	192375/832	69255/208	5000211/10985	1121931/1625
3 Max. motor shaft diameter	mm	3.2	3.2	3.2	3.2	3.2	4	3.2	3.2	3.2	3.2
Part Numbers		370686	**370689**	370692	370779	370782	**370785**	370795	370800	370805	370809
1 Reduction		5.4:1	19:1	29:1	72:1	89:1	128:1	270:1	370:1	479:1	850:1
2 Absolute reduction		27/5	3249/169	729/25	48735/676	4617/52	41553/325	731025/2704	10556001/28561	124659/260	531441/625
3 Max. motor shaft diameter	mm	2.5	3.2	2.5	3.2	3.2	3.2	3.2	3.2	3.2	2.5
Part Numbers							370786	370796	370801	370806	
1 Reduction							157:1	285:1	389:1	561:1	
2 Absolute reduction							19683/125	18225/64	263169/676	2368521/4225	
3 Max. motor shaft diameter	mm						2.5	4	3.2	3.2	
4 Number of stages		1	2	2	3	3	3	4	4	4	4
5 Max. continuous torque	Nm	2	2.4	2.4	3	3	3	3.4	3.4	3.4	3.4
6 Max. intermittent torque at gear output	Nm	2.5	3	3	3.5	3.5	3.5	3.8	3.8	3.8	3.8
7 Max. efficiency	%	84	70	70	59	59	59	49	49	49	49
8 Weight	g	51	64	64	78	78	78	91	91	91	91
9 Average backlash no load	°	1.0	1.2	1.2	1.6	1.6	1.6	2.0	2.0	2.0	2.0
10 Mass inertia	gcm²	0.6	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
11 Gearhead length L1	mm	25.3	32.3	32.3	39.0	39.0	39.0	45.7	45.7	45.7	45.7

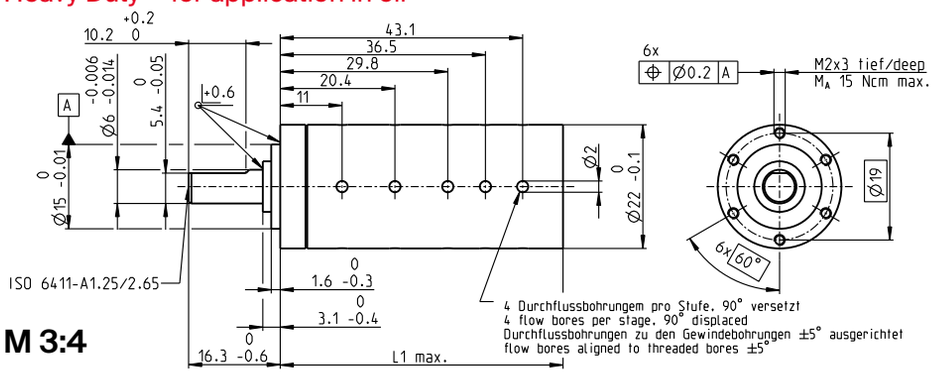




maxon Modular System											
+ Motor	Page	**+ Sensor/Brake**	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor/brake) + assembly parts										
EC-max 22, 12 W	238			57.4	64.4	64.4	71.1	71.1	71.1	77.8	77.8	77.8	77.8
EC-max 22, 12 W	238	MR	462	67.1	74.1	74.1	80.8	80.8	80.8	87.5	87.5	87.5	87.5
EC-max 22, 12 W	238	AB 20	516	93.0	100.0	100.0	106.7	106.7	106.7	113.4	113.4	113.4	113.4
EC-max 22, 25 W	239			73.9	80.9	80.9	87.6	87.6	87.6	94.3	94.3	94.3	94.3
EC-max 22, 25 W	239	MR	462	83.6	90.6	90.6	97.3	97.3	97.3	104.0	104.0	104.0	104.0
EC-max 22, 25 W	239	AB 20	516	109.5	116.5	116.5	123.2	123.2	123.2	129.9	129.9	129.9	129.9
EC-4pole 22, 90 W	247			74.0	81.0	81.0	87.7	87.7	87.7	94.4	94.4	94.4	94.4
EC-4pole 22, 90 W	247	16 EASY/XT/Abs.	449-453	86.2	93.2	93.2	99.9	99.9	99.9	106.6	106.6	106.6	106.6
EC-4pole 22, 90 W	247	16 EASY Abs. XT	455	86.7	93.7	93.7	100.4	100.4	100.4	107.1	107.1	107.1	107.1
EC-4pole 22, 90 W	247	16 RIO	466	84.7	91.7	91.7	98.4	98.4	98.7	105.1	105.1	105.1	105.1
EC-4pole 22, 90 W	247	AEDL/HEDL	469/475	95.5	102.5	102.5	109.2	109.2	109.2	115.9	115.9	115.9	115.9
EC-4pole 22, 120 W	248			91.4	98.4	98.4	105.1	105.1	105.1	111.8	111.8	111.8	111.8
EC-4pole 22, 120 W	248	16 EASY/XT/Abs.	449-453	103.6	110.6	110.6	117.3	117.3	117.3	124.0	124.0	124.0	124.0
EC-4pole 22, 120 W	248	16 EASY Abs. XT	455	104.1	111.1	111.1	117.8	117.8	117.8	124.5	124.5	124.5	124.5
EC-4pole 22, 120 W	248	16 RIO	466	102.1	109.1	109.1	115.8	115.8	115.8	122.5	122.5	122.5	122.5
EC-4pole 22, 120 W	248	AEDL/HEDL	469/475	112.9	119.9	119.9	126.6	126.6	126.6	133.3	133.3	133.3	133.3

Planetary Gearhead GP 22 HD ∅22 mm, 2.0–4.0 Nm

Heavy Duty – for application in oil



M 3:4

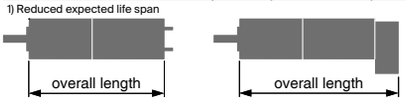
Technical Data	
Planetary Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	ball bearing
Radial play, 10 mm from flange	max. 0.2 mm
Axial play	max. 0.1 mm
Max. axial load (dynamic)	100 N
Max. force for press fits	100 N
Direction of rotation, drive to output	=
Max. continuous input speed	11'000 rpm
Recommended temperature range	-55...+200°C
Extended range as option	-55...+260°C

Number of stages	1	2	3	4	5
Max. radial load, 10 mm from flange	55 N	85 N	100 N	110 N	110 N

Stock program
Standard program
Special program (on request)

Part Numbers	410657	410637	410558	416698	409667	416709	416738	416211	416747	416753	416760
Gearhead Data (provisional)											
1 Reduction	3.8:1	14:1	53:1	104:1	198:1	370:1	561:1	742:1	1386:1	1798:1	3027:1
2 Absolute reduction	15/4	225/16	3375/64	87723/845	50625/256	10556001/28561	2368521/4225	759375/1024	158340015/114244	373977/208	6395006 7/21125
3 Max. motor shaft diameter mm	4	4	4	3.2	4	3.2	4	4	3.2	3.2	3.2
Part Numbers	416684	416686	416693	416699	416703	416710	416739	416742	416748	416754	416762
1 Reduction	4.4:1	16:1	62:1	109:1	231:1	389:1	590:1	867:1	1460:1	1996:1	3189:1
2 Absolute reduction	57/13	855/52	12825/208	2187/20	192375/832	263169/676	59049/100	2885625/3328	3947535/2704	285012027/142805	1594323/500
3 Max. motor shaft diameter mm	3.2	3.2	3.2	4	3.2	3.2	4	3.2	3.2	3.2	4
Part Numbers		416687	416694	416701	416704	416711	416740	416743	416749	416756	416763
1 Reduction		19:1	72:1	128:1	270:1	410:1	690:1	1014:1	1538:1	2102:1	3728:1
2 Absolute reduction		3249/169	48735/676	41553/325	731025/2704	6561/16	1121931/1625	10965375/10816	98415/64	7105563/3380	30292137/8125
3 Max. motor shaft diameter mm		3.2	3.2	3.2	3.2	4	3.2	3.2	4.0	3.2	3.2
Part Numbers		416688	416695		416706	416736		416744	416751	416757	
1 Reduction		20:1	76:1		285:1	455:1		1068:1	1621:1	2214:1	
2 Absolute reduction		81/4	1215/16		18225/64	5000211/10985		273375/256	60169205 7/371293	177147/80	
3 Max. motor shaft diameter mm		4	4		4	3.2		4	3.2	4	
Part Numbers		416689	416696		416707	416737		416745	416752	416758	
1 Reduction		24:1	84:1		316:1	479:1		1185:1	1707:1	2458:1	
2 Absolute reduction		1539/65	185193/2197		2777895/6788	124659/260		41668425/35152	15000633/8788	13500569 7/54925	
3 Max. motor shaft diameter mm		3.2	3.2		3.2	3.2		3.2	3.2	3.2	
Part Numbers			416697		416708			416746		416759	
1 Reduction			89:1		333:1			1249:1		2589:1	
2 Absolute reduction			4617/52		69255/208			1038825/832		3365793/1300	
3 Max. motor shaft diameter mm			3.2		3.2			3.2		3.2	
4 Number of stages	1	2	3	3	4	4	4	5	5	5	5
5 Max. continuous torque Nm	2	2.4	3	3	3.4	3.4	3.4	4	4	4	4
6 Max. intermittent torque at gear output Nm	2.5	3	3.5	3.5	3.8	3.8	3.8	4.4	4.4	4.4	4.4
15 Max. overload torque[1] Nm	6	9	12	12	12	12	12	12	12	12	12
7 Max. efficiency %	95	87	78	78	65	65	65	52	52	52	52
8 Weight g	46	65	82	82	96	96	96	110	110	110	110
9 Average backlash no load °	1.0	1.2	1.6	1.6	2.0	2.0	2.0	2.5	2.5	2.5	2.5
10 Mass inertia gcm²	0.6	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
11 Gearhead length L1 mm	20.6	29.7	38.2	38.2	45.0	45.0	45.0	51.8	51.8	51.8	51.8
13 Max. transmittable power (continuous) W	160	100	40	40	20	20	20	6	6	6	6
14 Max. transmittable power (intermittent) W	240	150	60	60	30	30	30	9	9	9	9

1) Reduced expected life span

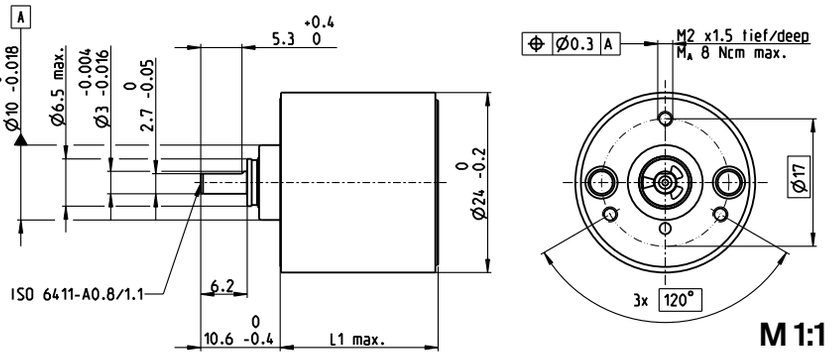


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts										
EC 22, 240 W, A	227			110.5	119.5	128.0	128.0	135.0	135.0	135.0	141.5	141.5	141.5	141.5
EC 22, 240 W, B	227			98.1	107.5	116.0	116.0	122.4	122.4	122.4	129.5	129.5	129.5	129.5

Application	Important Notice
General	This gearhead has been designed for applications in oil and is only equipped with minimum lubrication. Therefore it is not permitted to use it under normal air conditions.
– extreme temperature applications	
– vibration tested according to MIL-STD810F/ Jan2000 Fig. 514.5C-10	
– operation in oil and high pressure	
Oil & Gas Industry	
– oil, gas and geothermal wells	

Spur Gearhead GS 24 A ∅24 mm, 0.1 Nm



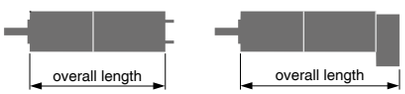
Technical Data

Spur Gearhead	straight teeth
Housing	plastic
Output shaft	stainless steel, hardened
Bearing at output	sleeve bearing
Radial play, 8 mm from flange	max. 0.038 mm
Axial play	0.03–0.30 mm
Max. axial load (dynamic)	8 N
Max. force for press fits	500 N
Max. continuous input speed	4000 rpm
Recommended temperature range	-15...+80°C
Max. radial load, 8 mm from flange	5 N

Stock program
Standard program
Special program (on request)

Gearhead Data		Part Numbers						
		110480	110481	**110482**	110483	**110484**	110485	**110486**
1 Reduction		7.2:1	20:1	32:1	64:1	131:1	199:1	325:1
2 Absolute reduction		93/13	753424/38025	92352/28561	837/13	212629/1625	88750368/4455516	1407000/43264
3 Max. motor shaft diameter	mm	2	2	2	2	2	2	2
4 Number of stages		2	4	4	4	4	6	6
5 Max. continuous torque	Nm	0.1	0.1	0.1	0.1	0.1	0.1	0.1
6 Max. intermittent torque at gear output	Nm	0.15	0.15	0.15	0.15	0.15	0.15	0.15
12 Direction of rotation, drive to output		=	=	=	=	=	=	=
7 Max. efficiency	%	81	66	66	66	66	53	53
8 Weight	g	25	28	28	28	28	30	30
9 Average backlash no load	°	1.0	2.0	2.0	2.0	2.0	3.0	3.0
10 Mass inertia	gcm²	0.008	0.01	0.008	0.007	0.006	0.008	0.006
11 Gearhead length L1*	mm	16.5	20.2	20.2	20.2	20.2	24	24

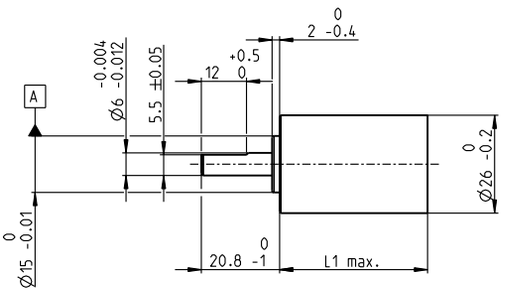
*L1 for A-max 22 L1 is –2.8 mm

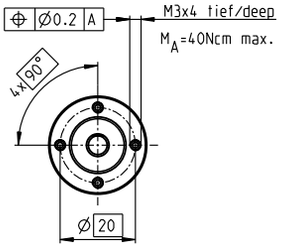


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor/brake) + assembly parts						
A-max 19	153/154			45.5	49.2	49.2	49.2	49.2	53.0	53.0
A-max 19, 1.5 W	154	MR	460/461	50.6	54.3	54.3	54.3	54.3	58.1	58.1
A-max 19, 1.5 W	154	Enc 22	468	59.9	63.6	63.6	63.6	63.6	67.4	67.4
A-max 19, 2.5 W	155/156			48.1	51.8	51.8	51.8	51.8	55.6	55.6
A-max 19, 2.5 W	156	MR	460/461	52.4	56.1	56.1	56.1	56.1	59.9	59.9
A-max 19, 2.5 W	156	Enc 22	468	62.5	66.2	66.2	66.2	66.2	70.0	70.0
A-max 22	157-160			45.7	49.4	49.4	49.4	49.4	53.2	53.2
A-max 22	158/160	MR	460/461	50.7	54.4	54.4	54.4	54.4	58.2	58.2
A-max 22	158/160	Enc 22	468	60.1	63.8	63.8	63.8	63.8	67.6	67.6

Planetary Gearhead GP 26 A ∅26 mm, 0.75–4.5 Nm





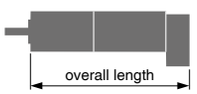
M 1:2

Technical Data			
Planetary Gearhead			straight teeth
Output shaft			stainless steel, hardened
Bearing at output			preloaded ball bearings
Radial play, 5 mm from flange			max. 0.1 mm
Axial play at axial load	< 6 N		0 mm
	> 6 N		max. 0.4 mm
Max. axial load (dynamic)			120 N
Max. force for press fits			120 N
Direction of rotation, drive to output			=
Max. continuous input speed			8000 rpm
Recommended temperature range			-30...+100°C
Extended range as option			-40...+100°C
Number of stages	1	2	3
Max. radial load, 12 mm from flange	70 N	110 N	140 N

gear

Stock program
Standard program
Special program (on request)

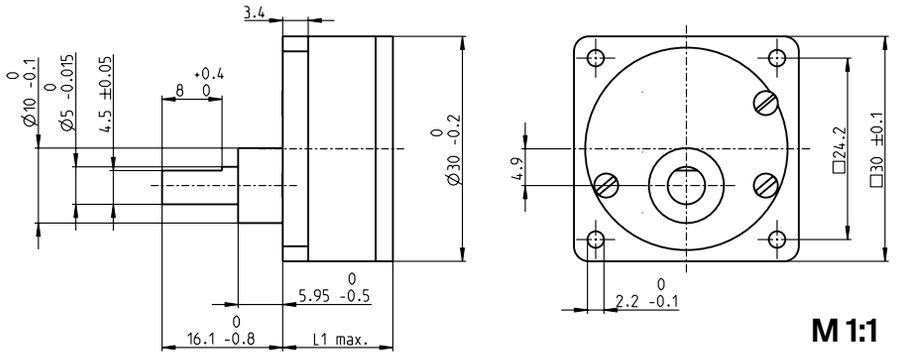
Part Numbers	406757	406762	406764	406767	406128	406769	406770	406771	406092
Gearhead Data									
1 Reduction	5.2:1	19:1	27:1	35:1	71:1	100:1	139:1	181:1	236:1
2 Absolute reduction	57/11	3591/187	3249/121	1539/44	226233/3179	204687/2057	185193/1331	87723/484	41553/176
3 Max. motor shaft diameter mm	3	3	3	3	3	3	3	3	3
4 Number of stages	1	2	2	2	3	3	3	3	3
5 Max. continuous torque Nm	0.75	2.25	2.25	2.25	4.5	4.5	4.5	4.5	4.5
6 Max. intermittent torque at gear output Nm	1.1	3.2	3.2	3.2	6.2	6.2	6.2	6.2	6.2
7 Max. efficiency %	90	80	80	80	70	70	70	70	70
8 Weight g	53	77	77	77	93	93	93	93	93
9 Average backlash no load °	0.5	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8
10 Mass inertia gcm^2	0.96	0.54	0.54	0.54	0.31	0.31	0.31	0.31	0.31
11 Gearhead length L1 mm	23.4	32.9	32.9	32.9	39.5	39.5	39.5	39.5	39.5
13 Max. transmittable power (continuous) W	60	35	35	35	20	20	20	20	20
14 Max. transmittable power (intermittent) W	90	50	50	50	30	30	30	30	30



maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor/brake) + assembly parts								
RE 25	134/136			78.0	87.5	87.5	87.5	94.1	94.1	94.1	94.1	94.1
RE 25	134/136	MR	463	89.0	98.5	98.5	98.5	105.1	105.1	105.1	105.1	105.1
RE 25	134/136	Enc 22	468	92.1	101.6	101.6	101.6	108.2	108.2	108.2	108.2	108.2
RE 25	134/136	HED_ 5540	471/473	98.8	108.3	108.3	108.3	114.9	114.9	114.9	114.9	114.9
RE 25	134/136	DCT 22	480	100.3	109.8	109.8	109.8	116.4	116.4	116.4	116.4	116.4
RE 25, 20 W	135			66.5	76.0	76.0	76.0	82.6	82.6	82.6	82.6	82.6
RE 25, 20 W	135	MR	463	77.5	87.0	87.0	87.0	93.6	93.6	93.6	93.6	93.6
RE 25, 20 W	135	HED_ 5540	472	87.3	96.8	96.8	96.8	103.4	103.4	103.4	103.4	103.4
RE 25, 20 W	135	DCT 22	480	88.8	98.3	98.3	98.3	104.9	104.9	104.9	104.9	104.9
RE 25, 20 W	135	AB 28	519	100.6	110.1	110.1	110.1	116.7	116.7	116.7	116.7	116.7
RE 25, 20 W	135	HED_5540/AB 28	472/519	117.8	127.3	127.3	127.3	133.9	133.9	133.9	133.9	133.9
RE 25, 20 W	136	AB 28	519	112.1	121.6	121.6	121.6	128.2	128.2	128.2	128.2	128.2
RE 25, 20 W	136	HED_ 5540/AB 28	473/519	129.3	138.8	138.8	138.8	145.4	145.4	145.4	145.4	145.4
A-max 26	161-164			68.2	77.7	77.7	77.7	84.3	84.3	84.3	84.3	84.3
A-max 26	161-164	MR	463	77.0	86.5	86.5	86.5	93.1	93.1	93.1	93.1	93.1
A-max 26	161-164	Enc 22	468	82.6	92.1	92.1	92.1	98.7	98.7	98.7	98.7	98.7
A-max 26	161-164	HED_ 5540	472/474	86.6	96.1	96.1	96.1	102.7	102.7	102.7	102.7	102.7

Spur Gearhead GS 30 A ∅30 mm, 0.07–0.2 Nm

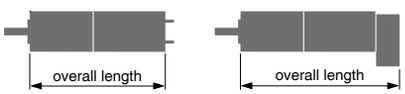


Technical Data	
Spur Gearhead	straight teeth
Output shaft	stainless steel
Shaft diameter as option	8 mm
Bearing at output	sleeve bearing
Radial play, 5 mm from flange	max. 0.1 mm
Axial play	0.03–0.2 mm
Max. axial load (dynamic)	15 N
Max. force for press fits	400 N
Max. continuous input speed	5000 rpm
Recommended temperature range	-5...+80°C
Max. radial load, 5 mm from flange	35 N

Option: Low-noise version

Stock program
Standard program
Special program (on request)

Part Numbers	110445	110446	110447	110448	110449	110450
Gearhead Data						
1 Reduction	15:1	30:1	60:1	100:1	200:1	500:1
2 Absolute reduction	15	30	60	100	200	500
3 Max. motor shaft diameter mm	2	2	2	2	2	2
4 Number of stages	3	3	4	4	5	6
5 Max. continuous torque Nm	0.07	0.07	0.10	0.10	0.20	0.20
6 Max. intermittent torque at gear output Nm	0.21	0.21	0.30	0.30	0.60	0.60
12 Direction of rotation, drive to output	≠	≠	=	=	≠	=
7 Max. efficiency %	73	73	66	66	60	53
8 Weight g	40	40	45	45	50	55
9 Average backlash no load °	1.0	1.0	1.5	1.5	2.0	2.5
10 Mass inertia gcm^2	0.17	0.14	0.12	0.10	0.10	0.10
11 Gearhead length L1 mm	23.0	23.0	25.5	25.5	30.5	30.5

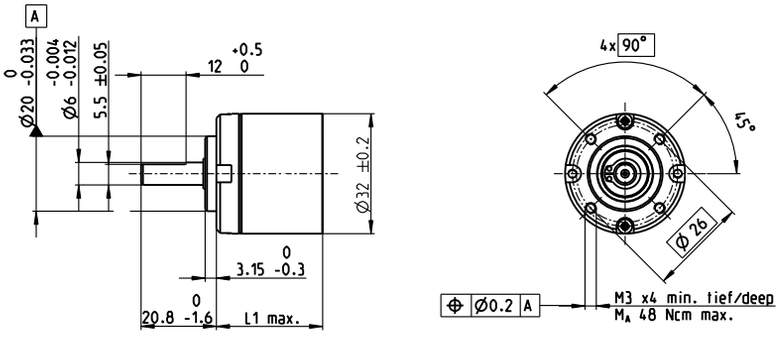


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts					
A-max 26	161-164			67.8	67.8	70.3	70.3	75.3	75.3
A-max 26	161-164	MR	463	76.6	76.6	79.1	79.1	84.1	84.1
A-max 26	161-164	Enc 22	468	82.2	82.2	84.7	84.7	89.7	89.7
A-max 26	161-164	HED_ 5540	472/474	86.2	86.2	88.7	88.7	93.7	93.7

Planetary Gearhead GP 32 BZ ∅32 mm, 0.75–4.5 Nm

Low Backlash



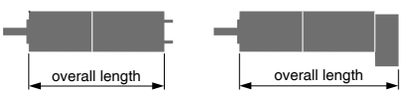
M 1:2

Technical Data			
Planetary Gearhead	straight teeth		
Output shaft	stainless steel, hardened		
Bearing at output	ball bearing		
Radial play, 5 mm from flange	max. 0.1 mm		
Axial play	max. 0.7 mm		
Max. axial load (dynamic)	120 N		
Max. force for press fits	120 N		
Direction of rotation, drive to output	=		
Max. continuous input speed	4000 rpm		
Recommended temperature range	-40...+100°C		
Number of stages	1	2	3
Max. radial load, 12 mm from flange	70 N	110 N	130 N

Stock program
Standard program
Special program (on request)

Part Numbers	358975	351942	358331	357988	358335	358385	358512	358513	358515	358516
Gearhead Data										
1 Reduction	3.7:1	5.2:1	19:1	27:1	35:1	71:1	100:1	139:1	181:1	236:1
2 Absolute reduction	63/17	57/11	3591/187	3249/121	1539/44	226233/3179	204687/2057	185193/1331	87723/484	41553/176
3 Max. motor shaft diameter mm	5.5	3	3	3	3	3	3	3	3	3
4 Number of stages	1	1	2	2	2	3	3	3	3	3
5 Max. continuous torque Nm	0.75	0.75	2.25	2.25	2.25	4.5	4.5	4.5	4.5	4.5
Max. continuous torque within the preloading Nm	0.5	0.5	1.1	1.1	1.1	1.7	1.7	1.7	1.7	1.7
6 Max. intermittent torque at gear output Nm	1.1	1.1	3.2	3.2	3.2	6.2	6.2	6.2	6.2	6.2
7 Max. efficiency %	85	85	80	80	80	70	70	70	70	70
8 Weight g	150	150	190	190	190	240	240	240	240	240
9 Average backlash no load °	0.15	0.15	0.35	0.35	0.35	0.5	0.5	0.5	0.5	0.5
10 Mass inertia gcm²	1.25	1.25	0.75	0.75	0.75	0.7	0.7	0.7	0.7	0.7
11 Gearhead length L1* mm	33.5	33.5	43.6	43.6	43.6	53.1	53.1	53.1	53.1	53.1

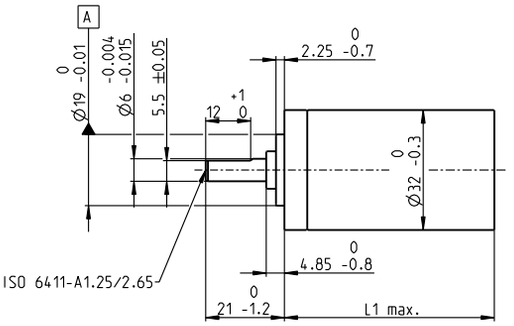
*for EC 32 L1 is + 6.4 mm, for RE 30 L1 is + 1.0 mm

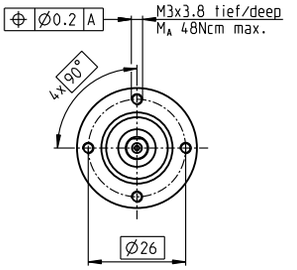


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts									
RE 25	134/136			88.1	88.1	98.2	98.2	98.2	107.7	107.7	107.7	107.7	107.7
RE 25	134/136	MR	463	99.1	99.1	109.2	109.2	109.2	118.7	118.7	118.7	118.7	118.7
RE 25	134/136	Enc 22	468	102.2	102.2	112.3	112.3	112.3	121.8	121.8	121.8	121.8	121.8
RE 25	134/136	HED_ 5540	471/473	108.9	108.9	119.0	119.0	119.0	128.5	128.5	128.5	128.5	128.5
RE 25	134/136	DCT 22	480	110.4	110.4	120.5	120.5	120.5	130.0	130.0	130.0	130.0	130.0
RE 25, 20 W	135			76.6	76.6	86.7	86.7	86.7	96.2	96.2	96.2	96.2	96.2
RE 25, 20 W	135	MR	463	87.6	87.6	97.7	97.7	97.7	107.2	107.2	107.2	107.2	107.2
RE 25, 20 W	135	HED_ 5540	472/473	97.4	97.4	107.5	107.5	107.5	117.0	117.0	117.0	117.0	117.0
RE 25, 20 W	135	DCT 22	480	98.9	98.9	109.0	109.0	109.0	118.5	118.5	118.5	118.5	118.5
RE 25, 20 W	135	AB 28	519	110.7	110.7	120.8	120.8	120.8	130.3	130.3	130.3	130.3	130.3
RE 25, 20 W	135	HED_ 5540/AB 28	472/519	127.9	127.9	138.0	138.0	138.0	147.5	147.5	147.5	147.5	147.5
RE 25, 20 W	136	AB 28	519	122.2	122.2	132.3	132.3	132.3	141.8	141.8	141.8	141.8	141.8
RE 25, 20 W	136	HED_ 5540/AB 28	471/519	139.4	139.4	149.5	149.5	149.5	159.0	159.0	159.0	159.0	159.0
RE 30, 60 W	138			102.6	102.6	112.7	112.7	112.7	122.2	122.2	122.2	122.2	122.2
RE 30, 60 W	138	MR	464	114.0	114.0	124.1	124.1	124.1	133.6	133.6	133.6	133.6	133.6
RE 30, 60 W	138	HED_ 5540	471/473	123.4	123.4	133.5	133.5	133.5	143.0	143.0	143.0	143.0	143.0
RE 35, 90 W	139			104.6	104.6	114.7	114.7	114.7	124.2	124.2	124.2	124.2	124.2
RE 35, 90 W	139	MR	464	116.0	116.0	126.1	126.1	126.1	135.6	135.6	135.6	135.6	135.6
RE 35, 90 W	139	HED_ 5540	471/473	125.3	125.3	135.4	135.4	135.4	144.9	144.9	144.9	144.9	144.9
RE 35, 90 W	139	DCT 22	480	122.7	122.7	132.8	132.8	132.8	142.3	142.3	142.3	142.3	142.3
RE 35, 90 W	139	AB 28	519	140.7	140.7	150.8	150.8	150.8	160.3	160.3	160.3	160.3	160.3
RE 35, 90 W	139	HEDS 5540/AB 28	471/519	157.9	157.9	168.0	168.0	168.0	177.5	177.5	177.5	177.5	177.5
A-max 26	161-164			78.3	78.3	88.4	88.4	88.4	97.9	97.9	97.9	97.9	97.9
A-max 26	161-164	MR	463	87.1	87.1	97.2	97.2	97.2	106.7	106.7	106.7	106.7	106.7
A-max 26	161-164	Enc 22	468	92.7	92.7	102.8	102.8	102.8	112.3	112.3	112.3	112.3	112.3
A-max 26	161-164	HED_ 5540	472/474	96.7	96.7	106.8	106.8	106.8	116.3	116.3	116.3	116.3	116.3
A-max 32	165			96.5	96.5	106.6	106.6	106.6	116.1	116.1	116.1	116.1	116.1
A-max 32	166			95.1	95.1	105.2	105.2	105.2	114.7	114.7	114.7	114.7	114.7
A-max 32	166	MR	464	106.3	106.3	116.4	116.4	116.4	125.9	125.9	125.9	125.9	125.9
A-max 32	166	HED_ 5540	472/473	115.9	115.9	126.0	126.0	126.0	135.5	135.5	135.5	135.5	135.5
EC 32, 80 W	228			100.2	100.2	110.3	110.3	110.3	119.8	119.8	119.8	119.8	119.8
EC 32, 80 W	228	HED_ 5540	472/475	118.6	118.6	128.7	128.7	128.7	138.2	138.2	138.2	138.2	138.2
EC 32, 80 W	228	Res 26	481	120.3	120.3	130.4	130.4	130.4	139.9	139.9	139.9	139.9	139.9

Planetary Gearhead GP 32 A ∅32 mm, 0.75–4.5 Nm





M 1:2

Technical Data	
Planetary Gearhead	straight teeth
Output shaft	stainless steel
Shaft diameter as option	8 mm
Bearing at output	ball bearing
Radial play, 5 mm from flange	max. 0.14 mm
Axial play	max. 0.4 mm
Max. axial load (dynamic)	120 N
Max. force for press fits	120 N
Direction of rotation, drive to output	=
Max. continuous input speed	6000 rpm
Recommended temperature range	-40...+100°C

Number of stages	1	2	3	4	5
Max. radial load, 10 mm from flange	90 N	140 N	200 N	220 N	220 N

Option: Low-noise version

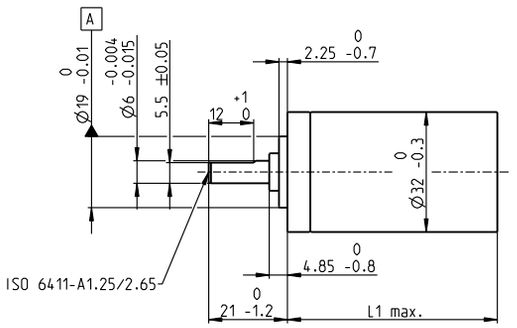
Stock program
Standard program
Special program (on request)

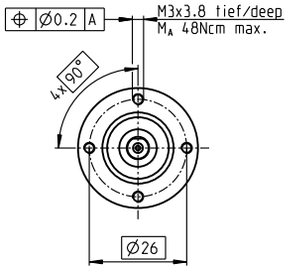
Part Numbers	166155	166158	166163	166164	166169	166174	166179	166184	166187	166192	166197	166202
Gearhead Data												
1 Reduction	3.7:1	14:1	33:1	51:1	111:1	246:1	492:1	762:1	1181:1	1972:1	2829:1	4380:1
2 Absolute reduction	26/7	676/49	529/16	17576/343	13824/125	421824/1715	86112/175	19044/25	10123776/8575	8626176/4375	495144/175	109503/25
3 Max. motor shaft diameter mm	6	6	3	6	4	4	3	3	4	4	3	3
Part Numbers	166156	166159		166165	166170	166175	166180	166185	166188	166193	166198	166203
1 Reduction	4.8:1	18:1		66:1	123:1	295:1	531:1	913:1	1414:1	2189:1	3052:1	5247:1
2 Absolute reduction	24/5	624/35		16224/245	6877/56	101062/343	331776/625	36501/40	2425488/1715	536406/245	1907712/625	839523/160
3 Max. motor shaft diameter mm	4	4		4	3	3	4	3	3	3	3	3
Part Numbers	166157	166160		166166	166171	166176	166181	166186	166189	166194	166199	166204
1 Reduction	5.8:1	21:1		79:1	132:1	318:1	589:1	1093:1	1526:1	2362:1	3389:1	6285:1
2 Absolute reduction	23/4	299/14		3887/49	3312/25	389376/1225	20631/35	279841/256	9345024/6125	2066688/875	474513/140	6436343/1024
3 Max. motor shaft diameter mm	3	3		3	3	4	3	3	4	3	3	3
Part Numbers		166161		166167	166172	166177	166182		166190	166195	166200	
1 Reduction		23:1		86:1	159:1	411:1	636:1		1694:1	2548:1	3656:1	
2 Absolute reduction		576/25		14976/175	1587/10	359424/875	79488/125		1162213/686	7962624/3125	457056/125	
3 Max. motor shaft diameter mm		4		4	3	4	3		3	4	3	
Part Numbers		166162		166168	166173	166178	166183		166191	166196	166201	
1 Reduction		28:1		103:1	190:1	456:1	706:1		1828:1	2623:1	4060:1	
2 Absolute reduction		138/5		3588/35	12167/64	89401/196	158171/224		2238912/1225	2056223/784	3637933/896	
3 Max. motor shaft diameter mm		3		3	3	3	3		3	3	3	
4 Number of stages	1	2	2	3	3	4	4	4	5	5	5	5
5 Max. continuous torque Nm	0.75	2.25	2.25	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50
6 Max. intermittent torque at gear output Nm	1.1	3.4	3.4	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
7 Max. efficiency %	80	75	75	70	70	60	60	60	50	50	50	50
8 Weight g	118	162	162	194	194	226	226	226	258	258	258	258
9 Average backlash no load °	0.7	0.8	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
10 Mass inertia gcm²	1.5	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
11 Gearhead length L1 mm	26.5	36.4	36.4	43.1	43.1	49.8	49.8	49.8	56.5	56.5	56.5	56.5

maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts											
RE 25	134/136			81.1	91.0	91.0	97.7	97.7	104.4	104.4	104.4	111.1	111.1	111.1	111.1
RE 25	134/136	MR	463	92.1	102.0	102.0	108.7	108.7	115.4	115.4	115.4	122.1	122.1	122.1	122.1
RE 25	134/136	Enc 22	468	95.2	105.1	105.1	111.8	111.8	118.5	118.5	118.5	125.2	125.2	125.2	125.2
RE 25	134/136	HED_ 5540	471/473	101.9	111.8	111.8	118.5	118.5	125.2	125.2	125.2	131.9	131.9	131.9	131.9
RE 25	134/136	DCT 22	480	103.4	113.3	113.3	120.0	120.0	126.7	126.7	126.7	133.4	133.4	133.4	133.4
RE 25, 20 W	135			69.6	79.5	79.5	86.2	86.2	92.9	92.9	92.9	99.6	99.6	99.6	99.6
RE 25, 20 W	135	MR	463	80.6	90.5	90.5	97.2	97.2	103.9	103.9	103.9	110.6	110.6	110.6	110.6
RE 25, 20 W	135	HED_ 5540	472/475	90.4	100.3	100.3	107.0	107.0	113.7	113.7	113.7	120.4	120.4	120.4	120.4
RE 25, 20 W	135	DCT 22	480	91.9	101.8	101.8	108.5	108.5	115.2	115.2	115.2	121.9	121.9	121.9	121.9
RE 25, 20 W	135	AB 28	519	103.7	113.6	113.6	120.3	120.3	127.0	127.0	127.0	133.7	133.7	133.7	133.7
RE 25, 20 W	135	HED_ 5540/AB 28	472/519	120.9	130.8	130.8	137.5	137.5	144.2	144.2	144.2	150.9	150.9	150.9	150.9
RE 25, 20 W	136	AB 28	519	115.2	125.1	125.1	131.8	131.8	138.5	138.5	138.5	145.2	145.2	145.2	145.2
RE 25, 20 W	136	HED_ 5540/AB 28	471/519	132.4	142.3	142.3	149.0	149.0	155.7	155.7	155.7	162.4	162.4	162.4	162.4
A-max 26	161-164			71.3	81.2	81.2	87.9	87.9	94.6	94.6	94.6	101.3	101.3	101.3	101.3
A-max 26	161-164	MR	463	80.1	90.0	90.0	96.7	96.7	103.4	103.4	103.4	110.1	110.1	110.1	110.1
A-max 26	161-164	Enc 22	468	85.7	95.6	95.6	102.3	102.3	109.0	109.0	109.0	115.7	115.7	115.7	115.7
A-max 26	161-164	HED_ 5540	472/474	89.7	99.6	99.6	106.3	106.3	113.0	113.0	113.0	119.7	119.7	119.7	119.7

Planetary Gearhead GP 32 A ∅32 mm, 0.75–4.5 Nm





M 1:2

Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel
Shaft diameter as option	8 mm
Bearing at output	ball bearing
Radial play, 5 mm from flange	max. 0.14 mm
Axial play	max. 0.4 mm
Max. axial load (dynamic)	120 N
Max. force for press fits	120 N
Direction of rotation, drive to output	=
Max. continuous input speed	6000 rpm
Recommended temperature range	-40...+100°C

Number of stages	1	2	3	4	5
Max. radial load, 10 mm from flange	90 N	140 N	200 N	220 N	220 N

Option: Low-noise version

Stock program
Standard program
Special program (on request)

Part Numbers	166155	166158	166163	166164	166169	166174	166179	166184	166187	166192	166197	166202
Gearhead Data												
1 Reduction	3.7:1	14:1	33:1	51:1	111:1	246:1	492:1	762:1	1181:1	1972:1	2829:1	4380:1
2 Absolute reduction	26/7	676/49	529/16	17576/343	13824/125	421824/1715	86112/175	19044/25	10123776/8575	8626176/4375	495144/175	109503/25
3 Max. motor shaft diameter mm	6	6	3	6	4	4	3	3	4	4	3	3
Part Numbers	166156	166159		166165	166170	166175	166180	166185	166188	166193	166198	166203
1 Reduction	4.8:1	18:1		66:1	123:1	295:1	531:1	913:1	1414:1	2189:1	3052:1	5247:1
2 Absolute reduction	24/5	624/35		16224/245	6877/56	101062/343	331776/625	3650/40	2425488/1715	536406/245	1907712/625	839523/160
3 Max. motor shaft diameter mm	4	4		4	3	3	4	3	3	3	3	3
Part Numbers	166157	166160		166166	166171	166176	166181	166186	166189	166194	166199	166204
1 Reduction	5.8:1	21:1		79:1	132:1	318:1	589:1	1093:1	1526:1	2362:1	3389:1	6285:1
2 Absolute reduction	23/4	299/14		3887/49	3312/25	38976/1225	20631/35	279841/256	9345024/6125	2066688/875	474513/140	6436343/1024
3 Max. motor shaft diameter mm	3	3		3	3	4	3	3	4	3	3	3
Part Numbers		166161		166167	166172	166177	166182		166190	166195	166200	
1 Reduction		23:1		86:1	159:1	411:1	636:1		1694:1	2548:1	3656:1	
2 Absolute reduction		576/25		14976/175	1587/10	359424/875	79488/125		1162213/686	7962624/3125	457056/125	
3 Max. motor shaft diameter mm		4		4	3	4	3		3	4	3	
Part Numbers		166162		166168	166173	166178	166183		166191	166196	166201	
1 Reduction		28:1		103:1	190:1	456:1	706:1		1828:1	2623:1	4060:1	
2 Absolute reduction		138/5		3588/35	12167/64	89401/196	15817/224		2238912/1225	2056223/784	3637933/896	
3 Max. motor shaft diameter mm		3		3	3	3	3		3	3	3	
4 Number of stages	1	2	2	3	3	4	4	4	5	5	5	5
5 Max. continuous torque Nm	0.75	2.25	2.25	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50
6 Max. intermittent torque at gear output Nm	1.1	3.4	3.4	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
7 Max. efficiency %	80	75	75	70	70	60	60	60	50	50	50	50
8 Weight g	118	162	162	194	194	226	226	226	258	258	258	258
9 Average backlash no load °	0.7	0.8	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
10 Mass inertia gcm²	1.5	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
11 Gearhead length L1* mm	26.5	36.4	36.4	43.1	43.1	49.8	49.8	49.8	56.5	56.5	56.5	56.5

*for EC 32 flat L1 is + 2.0 mm

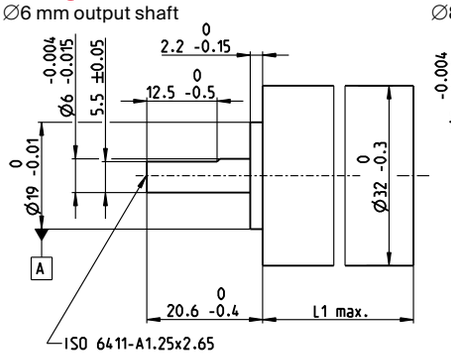
maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts											
RE 30, 15 W	137			94.6	104.5	104.5	111.2	111.2	117.9	117.9	117.9	124.6	124.6	124.6	124.6
RE 30, 15 W	137	MR	464	106.0	115.9	115.9	122.6	122.6	129.3	129.3	129.3	136.0	136.0	136.0	136.0
RE 30, 15 W	137	HED_ 5540	471/473	115.4	125.3	125.3	132.0	132.0	138.7	138.7	138.7	145.4	145.4	145.4	145.4
RE 30, 60 W	138			94.6	104.5	104.5	111.2	111.2	117.9	117.9	117.9	124.6	124.6	124.6	124.6
RE 30, 60 W	138	MR	464	106.0	115.9	115.9	122.6	122.6	129.3	129.3	129.3	136.0	136.0	136.0	136.0
RE 30, 60 W	138	HED_ 5540	471/473	115.4	125.3	125.3	132.0	132.0	138.7	138.7	138.7	145.4	145.4	145.4	145.4
RE 35, 90 W	139			97.6	107.5	107.5	114.2	114.2	120.9	120.9	120.9	127.6	127.6	127.6	127.6
RE 35, 90 W	139	MR	464	109.0	118.9	118.9	125.6	125.6	132.3	132.3	132.3	139.0	139.0	139.0	139.0
RE 35, 90 W	139	HED_ 5540	471/473	118.3	128.2	128.2	134.9	134.9	141.6	141.6	141.6	148.3	148.3	148.3	148.3
RE 35, 90 W	139	DCT 22	480	115.7	125.6	125.6	132.3	132.3	139.0	139.0	139.0	145.7	145.7	145.7	145.7
RE 35, 90 W	139	AB 28	519	133.7	143.6	143.6	150.3	150.3	157.0	157.0	157.0	163.7	163.7	163.7	163.7
RE 35, 90 W	139	HEDS 5540/AB 28	471/519	150.9	160.8	160.8	167.5	167.5	174.2	174.2	174.2	180.9	180.9	180.9	180.9
A-max 32	165			89.5	99.4	99.4	106.1	106.1	112.8	112.8	112.8	119.5	119.5	119.5	119.5
A-max 32	166			88.1	98.0	98.0	104.7	104.7	111.4	111.4	111.4	118.1	118.1	118.1	118.1
A-max 32	166	MR	464	99.3	109.2	109.2	115.9	115.9	122.6	122.6	122.6	129.3	129.3	129.3	129.3
A-max 32	166	HED_ 5540	472/474	108.9	118.8	118.8	125.5	125.5	132.2	132.2	132.2	138.9	138.9	138.9	138.9
EC 32, 80 W	228			86.6	96.5	96.5	103.2	103.2	109.9	109.9	109.9	116.6	116.6	116.6	116.6
EC 32, 80 W	228	HED_ 5540	472/475	105.0	114.9	114.9	121.6	121.6	128.3	128.3	128.3	135.0	135.0	135.0	135.0
EC 32, 80 W	228	Res 26	481	106.7	116.6	116.6	123.3	123.3	130.0	130.0	130.0	136.7	136.7	136.7	136.7
EC 32 flat, 15 W	282			44.5	54.4	54.4	61.1	61.1	67.8	67.8	67.8	74.5	74.5	74.5	74.5
EC 32 flat, IE, IP 00	283			54.6	64.5	64.5	71.2	71.2	77.9	77.9	77.9	84.6	84.6	84.6	84.6
EC 32 flat, IE, IP 40	283			56.3	66.2	66.2	72.9	72.9	79.6	79.6	79.6	86.3	86.3	86.3	86.3

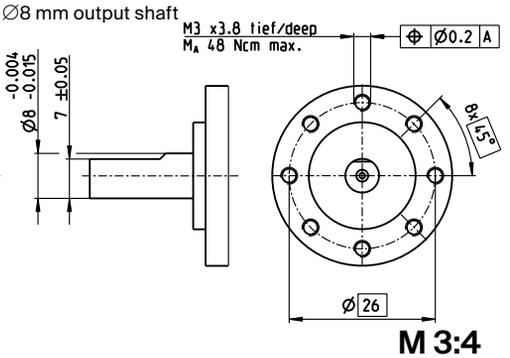
Planetary Gearhead GP 32 AR ∅32 mm, 0.75 Nm

for high radial loads

∅6 mm output shaft



∅8 mm output shaft

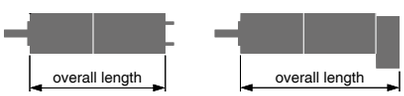


M 3:4

Technical Data		
Planetary Gearhead	straight teeth	
Output shaft	stainless steel	
Bearing at output	ball bearing	
Radial play, 5 mm from flange	max. 0.14 mm	
Axial play	max. 0.1 mm	
Max. axial load (dynamic)	120 N	
Max. force for press fits	120 N	
Direction of rotation, drive to output	=	
Max. continuous input speed	6000 rpm	
Recommended temperature range	-40...+100°C	
Output shaft diameter	6 mm	8 mm
Max. radial load, 10 mm from flange	140 N	120 N

Stock program
Standard program
Special program (on request)

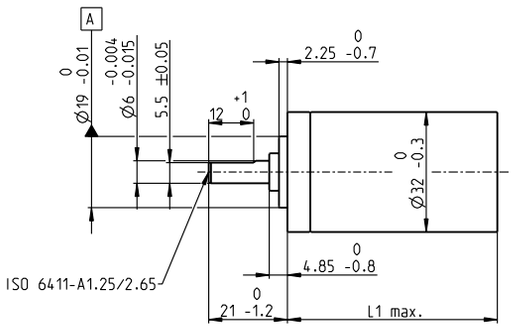
	Part Numbers	425862	425861	425860
Gearhead Data				
1	Reduction		3.7:1	4.8:1	5.8:1
2	Absolute reduction		26/7	24/5	23/4
3	Max. motor shaft diameter	mm	6	4	3
	Output shaft diameter	mm	6	6	6
	Part Numbers		425901	425899	425898
1	Reduction		3.7 : 1	4.8 : 1	5.8 : 1
2	Absolute reduction		26/7	24/5	23/4
3	Max. motor shaft diameter	mm	6	4	3
	Output shaft diameter	mm	8	8	8
4	Number of stages		1	1	1
5	Max. continuous torque	Nm	0.75	0.75	0.75
6	Max. intermittent torque at gear output	Nm	1.1	1.1	1.1
7	Max. efficiency	%	90	90	90
8	Weight	g	111	111	111
9	Average backlash no load	°	0.7	0.7	0.7
10	Mass inertia	gcm²	1.6	0.9	0.6
11	Gearhead length L1	mm	26.2	26.2	26.2

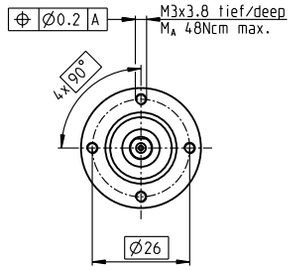


maxon Modular System						
+ Motor	Page	**+ Sensor/Brake**	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor/brake) + assembly parts		
RE 30, 60 W	138			94.3	94.3	94.3
RE 30, 60 W	138	MR	464	105.7	105.7	105.7
RE 30, 60 W	138	HED_5540	471/475	115.1	115.1	115.1
RE 35, 90 W	139			97.3	97.3	97.3
RE 35, 90 W	139	MR	464	108.7	108.7	108.7
RE 35, 90 W	139	HED_5540	471/475	118.0	118.0	118.0
RE 35, 90 W	139	DCT 22	480	115.4	115.4	115.4
RE 35, 90 W	139	AB 28	519	133.4	133.4	133.4
RE 35, 90 W	139	HED_ 5540/AB 28	471/519	150.5	150.5	150.5
EC 32, 80 W	228			86.3	86.3	86.3
EC 32, 80 W	228	HED_5540	472/474	104.7	104.7	104.7
EC 32, 80 W	228	Res 26	481	106.4	106.4	106.4

Planetary Gearhead GP 32 C ∅32 mm, 1.0–6.0 Nm

Ceramic Version





M 1:2

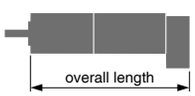
Technical Data	
Planetary Gearhead	straight teeth
Output shaft	stainless steel
Shaft diameter as option	8 mm
Bearing at output	ball bearing
Radial play, 5 mm from flange	max. 0.14 mm
Axial play	max. 0.4 mm
Max. axial load (dynamic)	120 N
Max. force for press fits	120 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-40...+100°C

Number of stages	1	2	3	4	5
Max. radial load, 10 mm from flange	90 N	140 N	200 N	220 N	220 N

Option: Low-noise version

Stock program
Standard program
Special program (on request)

Part Numbers	166930	166933	166938	166939	166944	166949	166954	166959	166962	166967	166972	166977
Gearhead Data												
1 Reduction	3.7:1	14:1	33:1	51:1	111:1	246:1	492:1	762:1	1181:1	1972:1	2829:1	4380:1
2 Absolute reduction	26/7	676/49	529/16	17576/343	13824/125	421824/1715	86112/175	19044/25	10123776/8575	8626176/4375	495144/175	109503/25
3 Max. motor shaft diameter mm	6	6	3	6	4	4	3	3	4	4	3	3
Part Numbers	166931	166934		166940	166945	166950	166955	166960	166963	166968	166973	166978
1 Reduction	4.8:1	18:1		66:1	123:1	295:1	531:1	913:1	1414:1	2189:1	3052:1	5247:1
2 Absolute reduction	24/5	624/35		16224/245	6877/56	101062/343	331776/625	36501/40	2425488/1715	536406/245	1907712/625	839523/160
3 Max. motor shaft diameter mm	4	4		4	3	3	4	3	3	3	3	3
Part Numbers	166932	166935		166941	166946	166951	166956	166961	166964	166969	166974	166979
1 Reduction	5.8:1	21:1		79:1	132:1	318:1	589:1	1093:1	1526:1	2362:1	3389:1	6285:1
2 Absolute reduction	23/4	299/14		3887/49	3312/25	389376/1225	20631/35	27984/256	9345024/6125	2066688/875	474513/140	6436343/1024
3 Max. motor shaft diameter mm	3	3		3	3	4	3	3	4	3	3	3
Part Numbers		166936		166942	166947	166952	166957		166965	166970	166975	
1 Reduction		23:1		86:1	159:1	411:1	636:1		1694:1	2548:1	3656:1	
2 Absolute reduction		576/25		14976/175	1587/10	359424/875	79488/125		1162213/686	7962624/3125	457056/125	
3 Max. motor shaft diameter mm		4		4	3	4	3		3	4	3	
Part Numbers		166937		166943	166948	166953	166958		166966	166971	166976	
1 Reduction		28:1		103:1	190:1	456:1	706:1		1828:1	2623:1	4060:1	
2 Absolute reduction		138/5		3588/35	12167/64	89401/196	158171/224		2238912/1225	2056223/784	3637933/896	
3 Max. motor shaft diameter mm		3		3	3	3	3		3	3	3	
4 Number of stages	1	2	2	3	3	4	4	4	5	5	5	5
5 Max. continuous torque Nm	1	3	3	6	6	6	6	6	6	6	6	6
6 Max. intermittent torque at gear output Nm	1.25	3.75	3.75	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
7 Max. efficiency %	80	75	75	70	70	60	60	60	50	50	50	50
8 Weight g	118	162	162	194	194	226	226	226	258	258	258	258
9 Average backlash no load °	0.7	0.8	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
10 Mass inertia gcm²	1.5	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
11 Gearhead length L1 mm	26.5	36.4	36.4	43.1	43.1	49.8	49.8	49.8	56.5	56.5	56.5	56.5

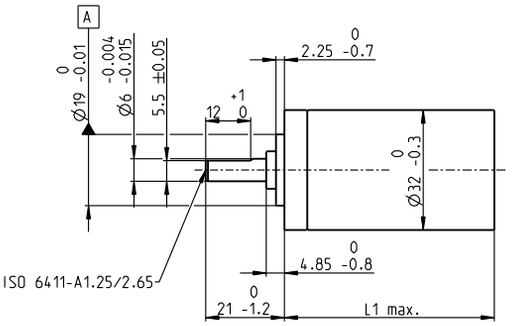


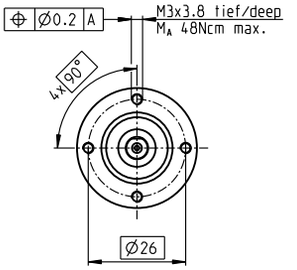
maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts											
RE 25, 10 W	134			81.1	91.0	91.0	97.7	97.7	104.4	104.4	104.4	111.1	111.1	111.1	111.1
RE 25, 10 W	134	MR	463	92.1	102.0	102.0	108.7	108.7	115.4	115.4	115.4	122.1	122.1	122.1	122.1
RE 25, 10 W	134	Enc 22	468	95.2	105.1	105.1	111.8	111.8	118.5	118.5	118.5	125.2	125.2	125.2	125.2
RE 25, 10 W	134	HED_5540	471/473	101.9	111.8	111.8	118.5	118.5	125.2	125.2	125.2	131.9	131.9	131.9	131.9
RE 25, 10 W	134	DCT 22	480	103.4	113.3	113.3	120.0	120.0	126.7	126.7	126.7	133.4	133.4	133.4	133.4
RE 25, 20 W	135			69.6	79.5	79.5	86.2	86.2	92.9	92.9	92.9	99.6	99.6	99.6	99.6
RE 25, 20 W	135	MR	463	80.6	90.5	90.5	97.2	97.2	103.9	103.9	103.9	110.6	110.6	110.6	110.6
RE 25, 20 W	135	HED_5540	471-473	90.4	100.3	100.3	107.0	107.0	113.7	113.7	113.7	120.4	120.4	120.4	120.4
RE 25, 20 W	135	DCT 22	480	91.9	101.8	101.8	108.5	108.5	115.2	115.2	115.2	121.9	121.9	121.9	121.9
RE 25, 20 W	135	AB 28	519	103.7	113.6	113.6	120.3	120.3	127.0	127.0	127.0	133.7	133.7	133.7	133.7
RE 25, 20 W	135	HED_5540/AB 28	471/519	120.9	130.8	130.8	137.5	137.5	144.2	144.2	144.2	150.9	150.9	150.9	150.9
RE 25, 20 W	136	AB 28	519	115.2	125.1	125.1	131.8	131.8	138.5	138.5	138.5	145.2	145.2	145.2	145.2
RE 25, 20 W	136	HED_5540/AB 28	471/519	132.4	142.3	142.3	149.0	149.0	155.7	155.7	155.7	162.4	162.4	162.4	162.4
RE 30, 60 W	138			94.6	104.5	104.5	111.2	111.2	117.9	117.9	117.9	124.6	124.6	124.6	124.6
RE 30, 60 W	138	MR	464	106.0	115.9	115.9	122.6	122.6	129.3	129.3	129.3	136.0	136.0	136.0	136.0
RE 30, 60 W	138	HED_5540	471/473	115.4	125.3	125.3	132.0	132.0	138.7	138.7	138.7	145.4	145.4	145.4	145.4
RE 35, 90 W	139			97.6	107.5	107.5	114.2	114.2	120.9	120.9	120.9	127.6	127.6	127.6	127.6
RE 35, 90 W	139	MR	464	109.0	118.9	118.9	125.6	125.6	132.3	132.3	132.3	139.0	139.0	139.0	139.0
RE 35, 90 W	139	HED_5540	471/473	118.3	128.2	128.2	134.9	134.9	141.6	141.6	141.6	148.3	148.3	148.3	148.3
RE 35, 90 W	139	DCT 22	480	115.7	125.6	125.6	132.3	132.3	139.0	139.0	139.0	145.7	145.7	145.7	145.7
RE 35, 90 W	139	AB 28	519	133.7	143.6	143.6	150.3	150.3	157.0	157.0	157.0	163.7	163.7	163.7	163.7
RE 35, 90 W	139	HEDS 5540/AB 28	471/519	150.9	160.8	160.8	167.5	167.5	174.2	174.2	174.2	180.9	180.9	180.9	180.9
A-max 26	161-164			71.3	81.2	81.2	87.9	87.9	94.6	94.6	94.6	101.3	101.3	101.3	101.3
A-max 26	162-164	MR	463	80.1	90.0	90.0	96.7	96.7	103.4	103.4	103.4	110.1	110.1	110.1	110.1
A-max 26	162-164	Enc 22	468	85.7	95.6	95.6	102.3	102.3	109.0	109.0	109.0	115.7	115.7	115.7	115.7
A-max 26	162-164	HED_5540	472/474	89.7	99.6	99.6	106.3	106.3	113.0	113.0	113.0	119.7	119.7	119.7	119.7
A-max 32	165			89.5	99.4	99.4	106.1	106.1	112.8	112.8	112.8	119.5	119.5	119.5	119.5
A-max 32	166			88.1	98.0	98.0	104.7	104.7	111.4	111.4	111.4	118.1	118.1	118.1	118.1
A-max 32	166	MR	464	99.3	109.2	109.2	115.9	115.9	122.6	122.6	122.6	129.3	129.3	129.3	129.3
A-max 32	166	HED_5540	472/474	108.9	118.8	118.8	125.5	125.5	132.2	132.2	132.2	138.9	138.9	138.9	138.9

Planetary Gearhead GP 32 C ∅32 mm, 1.0–6.0 Nm

Ceramic Version





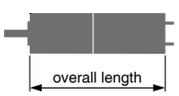
M 1:2

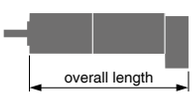
Technical Data	
Planetary Gearhead	straight teeth
Output shaft	stainless steel
Shaft diameter as option	8 mm
Bearing at output	ball bearing
Radial play, 5 mm from flange	max. 0.14 mm
Axial play	max. 0.4 mm
Max. axial load (dynamic)	120 N
Max. force for press fits	120 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-40...+100°C
Number of stages	1 2 3 4 5
Max. radial load, 10 mm from flange	90 N 140 N 200 N 220 N 220 N

Option: Low-noise version

Stock program
Standard program
Special program (on request)

Part Numbers												
	166930	166933	166938	166939	166944	166949	166954	166959	166962	166967	166972	166977
Gearhead Data												
1 Reduction	3.7:1	14:1	33:1	51:1	111:1	246:1	492:1	762:1	1181:1	1972:1	2829:1	4380:1
2 Absolute reduction	26/7	676/49	529/16	17576/343	13824/125	421824/1715	86112/175	19044/25	10123776/8575	8626176/4375	495144/175	109503/25
3 Max. motor shaft diameter mm	6	6	3	6	4	4	3	3	4	4	3	3
Part Numbers	**166931**	**166934**		**166940**	166945	166950	166955	166960	166963	166968	166973	166978
1 Reduction	4.8:1	18:1		66:1	123:1	295:1	531:1	913:1	1414:1	2189:1	3052:1	5247:1
2 Absolute reduction	24/5	624/35		16224/245	6877/56	101062/343	331776/625	36501/40	2425488/1715	536406/245	1907712/625	839523/160
3 Max. motor shaft diameter mm	4	4		4	3	3	4	3	3	3	3	3
Part Numbers	166932	166935		166941	166946	**166951**	166956	166961	166964	166969	166974	166979
1 Reduction	5.8:1	21:1		79:1	132:1	318:1	589:1	1093:1	1526:1	2362:1	3389:1	6285:1
2 Absolute reduction	23/4	299/14		3887/49	3312/25	389376/1225	20631/35	27984/256	9345024/6125	2066688/875	474513/140	6436343/1024
3 Max. motor shaft diameter mm	3	3		3	3	4	3	3	4	3	3	3
Part Numbers		166936		166942	166947	166952	166957		166965	166970	166975	
1 Reduction		23:1		86:1	159:1	411:1	636:1		1694:1	2548:1	3656:1	
2 Absolute reduction		576/25		14976/175	1587/10	359424/875	79488/125		1162213/686	7962624/3125	457056/125	
3 Max. motor shaft diameter mm		4		4	3	4	3		3	4	3	
Part Numbers		166937		166943	166948	166953	166958		166966	166971	166976	
1 Reduction		28:1		103:1	190:1	456:1	706:1		1828:1	2623:1	4060:1	
2 Absolute reduction		138/5		3588/35	12167/64	89401/196	158171/224		2238912/1225	2056223/784	3637933/896	
3 Max. motor shaft diameter mm		3		3	3	3	3		3	3	3	
4 Number of stages	1	2	2	3	3	4	4	4	5	5	5	5
5 Max. continuous torque Nm	1	3	3	6	6	6	6	6	6	6	6	6
6 Max. intermittent torque at gear output Nm	1.25	3.75	3.75	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
7 Max. efficiency %	80	75	75	70	70	60	60	60	50	50	50	50
8 Weight g	118	162	162	194	194	226	226	226	258	258	258	258
9 Average backlash no load °	0.7	0.8	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
10 Mass inertia gcm²	1.5	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
11 Gearhead length L1 mm	26.5	36.4	36.4	43.1	43.1	49.8	49.8	49.8	56.5	56.5	56.5	56.5



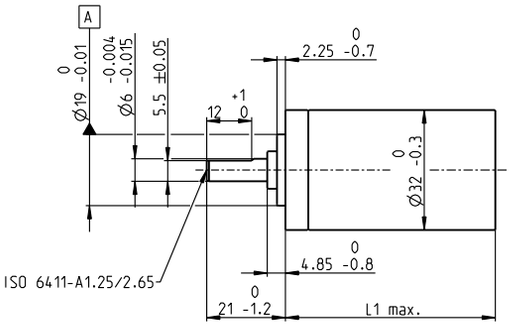


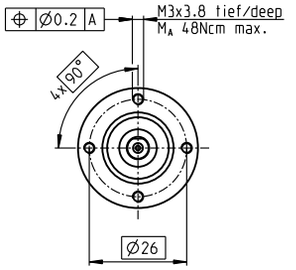
maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts											
EC 32, 80 W	228			86.6	96.5	96.5	103.2	103.2	109.9	109.9	109.9	116.6	116.6	116.6	116.6
EC 32, 80 W	228	HED_5540	472/475	105.0	114.9	114.9	121.6	121.6	128.3	128.3	128.3	135.0	135.0	135.0	135.0
EC 32, 80 W	228	Res 26	481	106.7	116.6	116.6	123.3	123.3	130.0	130.0	130.0	136.7	136.7	136.7	136.7
EC-max 22, 25 W	239			75.1	85.0	85.0	91.7	91.7	98.4	98.4	98.4	105.1	105.1	105.1	105.1
EC-max 22, 25 W	239	MR	462	84.8	94.7	94.7	101.4	101.4	108.1	108.1	108.1	114.8	114.8	114.8	114.8
EC-max 22, 25 W	239	AB 20	516	110.7	120.5	120.5	127.2	27.2	133.9	133.9	133.9	140.6	140.6	140.6	140.6
EC-max 30, 40 W	240			68.9	78.8	78.8	85.5	85.5	92.2	92.2	92.2	98.9	98.9	98.9	98.9
EC-max 30, 40 W	240	MR	463	81.1	91.0	91.0	97.7	97.7	104.4	104.4	104.4	111.1	111.1	111.1	111.1
EC-max 30, 40 W	240	HEDL 5540	474	89.5	99.4	99.4	106.1	106.1	112.8	112.8	112.8	119.5	119.5	119.5	119.5
EC-max 30, 40 W	240	AB 20	516	104.5	114.4	114.4	121.1	121.1	127.8	127.8	127.8	134.5	134.5	134.5	134.5
EC-max 30, 40 W	240	HEDL 5540/AB 20	475/516	125.1	135.0	135.0	141.7	141.7	148.4	148.4	148.4	155.1	155.1	155.1	155.1
EC-max 30, 60 W	241			90.9	100.8	100.8	107.4	107.4	114.7	114.7	114.7	120.8	120.8	120.8	120.8
EC-max 30, 60 W	241	MR	463	103.1	113.0	113.0	119.7	119.7	126.4	126.4	126.4	133.1	133.1	133.1	133.1
EC-max 30, 60 W	241	HEDL 5540	475	111.5	121.4	121.4	128.0	128.0	134.7	134.7	134.7	141.4	141.4	141.4	141.4
EC-max 30, 60 W	241	AB 20	516	126.5	136.4	136.4	143.0	143.0	149.7	149.7	149.7	156.4	156.4	156.4	156.4
EC-max 30, 60 W	241	HEDL 5540/AB 20	475/516	147.9	157.2	157.2	163.8	163.8	170.5	170.5	170.5	177.2	177.2	177.2	177.2
EC-4pole 22, 90 W	247			75.2	85.1	85.1	91.8	91.8	98.5	98.5	98.5	105.2	105.2	105.2	105.2
EC-4pole 22, 90 W	247	16 EASY/XT/Abs.	449–453	87.4	97.3	97.3	104.0	104.0	110.7	110.7	110.7	117.4	117.4	117.4	117.4
EC-4pole 22, 90 W	247	16 EASY Abs. XT	455	87.9	97.8	97.8	104.5	104.5	111.2	111.2	111.2	117.9	117.9	117.9	117.9
EC-4pole 22, 90 W	247	16 RIO	466	85.9	95.8	95.8	102.5	102.5	109.2	109.2	109.2	115.9	115.9	115.9	115.9
EC-4pole 22, 90 W	247	AEDL/HEDL	469/475	96.7	106.6	106.6	113.3	113.3	120.0	120.0	120.0	126.7	126.7	126.7	126.7
EC-4pole 22, 120 W	248			92.6	102.5	102.5	109.2	109.2	115.9	115.9	115.9	122.6	122.6	122.6	122.6
EC-4pole 22, 120 W	248	16 EASY/XT/Abs.	449–453	104.8	114.7	114.7	121.4	121.4	128.1	128.1	128.1	134.8	134.8	134.8	134.8
EC-4pole 22, 120 W	248	16 EASY Abs. XT	455	105.3	115.3	115.3	121.9	121.9	128.6	128.6	128.6	135.3	135.3	135.3	135.3
EC-4pole 22, 120 W	248	16 RIO	466	103.3	113.3	113.3	119.9	119.9	126.6	126.6	126.6	133.3	133.3	133.3	133.3
EC-4pole 22, 120 W	248	AEDL/HEDL	469/475	114.1	124.0	124.0	130.7	130.7	137.4	137.4	137.4	144.1	144.1	144.1	144.1
EC 32 flat, 15 W	282			44.5	54.4	54.4	61.1	61.1	67.8	67.8	67.8	74.5	74.5	74.5	74.5
EC 32 flat IE, IP 00	283			54.6	64.5	64.5	71.2	71.2	77.9	77.9	77.9	84.6	84.6	84.6	84.6
EC 32 flat IE, IP 40	283			56.3	66.2	66.2	72.9	72.9	79.6	79.6	79.6	86.3	86.3	86.3	86.3

Planetary Gearhead GP 32 C ∅32 mm, 1.0–6.0 Nm

Ceramic Version





M 1:2

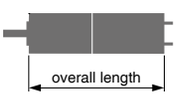
Technical Data	
Planetary Gearhead	straight teeth
Output shaft	stainless steel
Shaft diameter as option	8 mm
Bearing at output	ball bearing
Radial play, 5 mm from flange	max. 0.14 mm
Axial play	max. 0.4 mm
Max. axial load (dynamic)	120 N
Max. force for press fits	120 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-40...+100°C

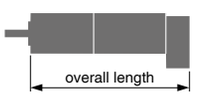
Number of stages	1	2	3	4	5
Max. radial load, 10 mm from flange	90 N	140 N	200 N	220 N	220 N

Option: Low-noise version

Stock program
Standard program
Special program (on request)

Part Numbers												
	166930	166933	166938	166939	166944	166949	166954	166959	166962	166967	166972	166977
Gearhead Data												
1 Reduction	3.7:1	14:1	33:1	51:1	111:1	246:1	492:1	762:1	1181:1	1972:1	2829:1	4380:1
2 Absolute reduction	$^{26}/_{7}$	$^{676}/_{49}$	$^{529}/_{16}$	$^{17576}/_{343}$	$^{13824}/_{125}$	$^{421824}/_{1715}$	$^{86112}/_{175}$	$^{19044}/_{25}$	$^{10123776}/_{8575}$	$^{8626176}/_{4375}$	$^{495144}/_{175}$	$^{109503}/_{25}$
3 Max. motor shaft diameter mm	6	6	3	6	4	4	3	3	4	4	3	3
Part Numbers	**166931**	**166934**		**166940**	166945	166950	166955	166960	166963	166968	166973	166978
1 Reduction	4.8:1	18:1		66:1	123:1	295:1	531:1	913:1	1414:1	2189:1	3052:1	5247:1
2 Absolute reduction	$^{24}/_{5}$	$^{624}/_{35}$		$^{16224}/_{245}$	$^{6877}/_{56}$	$^{101062}/_{343}$	$^{331776}/_{625}$	$^{3650}/_{40}$	$^{2425488}/_{1715}$	$^{536406}/_{245}$	$^{1907712}/_{625}$	$^{839523}/_{160}$
3 Max. motor shaft diameter mm	4	4		4	3	3	4	3	3	3	3	3
Part Numbers	166932	166935		166941	166946	**166951**	166956	166961	166964	166969	166974	166979
1 Reduction	5.8:1	21:1		79:1	132:1	318:1	589:1	1093:1	1526:1	2362:1	3389:1	6285:1
2 Absolute reduction	$^{23}/_{4}$	$^{299}/_{14}$		$^{3887}/_{49}$	$^{3312}/_{25}$	$^{389376}/_{1225}$	$^{20631}/_{35}$	$^{279841}/_{256}$	$^{9345024}/_{6125}$	$^{2066688}/_{875}$	$^{474513}/_{140}$	$^{6436343}/_{1024}$
3 Max. motor shaft diameter mm	3	3		3	3	4	3	3	4	3	3	3
Part Numbers		166936		166942	166947	166952	166957		166965	166970	166975	
1 Reduction		23:1		86:1	159:1	411:1	636:1		1694:1	2548:1	3656:1	
2 Absolute reduction		$^{576}/_{25}$		$^{14976}/_{175}$	$^{1587}/_{10}$	$^{359424}/_{875}$	$^{79488}/_{125}$		$^{1162213}/_{686}$	$^{7962624}/_{3125}$	$^{457056}/_{125}$	
3 Max. motor shaft diameter mm		4		4	3	4	3		3	4	3	
Part Numbers		166937		166943	166948	166953	166958		166966	166971	166976	
1 Reduction		28:1		103:1	190:1	456:1	706:1		1828:1	2623:1	4060:1	
2 Absolute reduction		$^{138}/_{5}$		$^{3588}/_{35}$	$^{12167}/_{64}$	$^{89401}/_{196}$	$^{15817}/_{224}$		$^{2238912}/_{1225}$	$^{2056223}/_{784}$	$^{3637933}/_{896}$	
3 Max. motor shaft diameter mm		3		3	3	3	3		3	3	3	
4 Number of stages	1	2	2	3	3	4	4	4	5	5	5	5
5 Max. continuous torque Nm	1	3	3	6	6	6	6	6	6	6	6	6
6 Max. intermittent torque at gear output Nm	1.25	3.75	3.75	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
7 Max. efficiency %	80	75	75	70	70	60	60	60	50	50	50	50
8 Weight g	118	162	162	194	194	226	226	226	258	258	258	258
9 Average backlash no load °	0.7	0.8	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
10 Mass inertia gcm^2	1.5	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
11 Gearhead length L1 mm	26.5	36.4	36.4	43.1	43.1	49.8	49.8	49.8	56.5	56.5	56.5	56.5





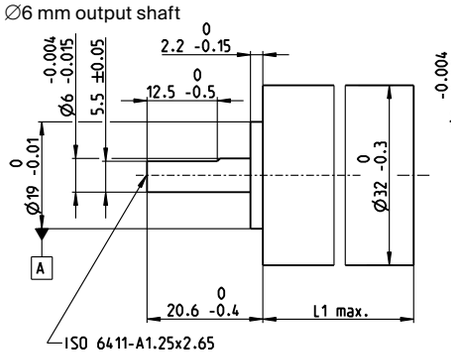
maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts											
EC-i 30, 20 W	257			68.6	78.5	78.5	85.2	85.2	91.9	91.9	91.9	98.6	98.6	98.6	98.6
EC-i 30, 30 W	258			68.8	78.7	78.7	85.4	85.4	92.1	92.1	92.1	98.8	98.8	98.8	98.8
EC-i 30, 30 W	258	16 EASY/Abs.	449–453	80.5	90.4	90.4	97.1	97.1	103.8	103.8	103.8	110.5	110.5	110.5	110.5
EC-i 30, 30 W	258	16 RIO	466	79.0	88.9	88.9	95.6	95.6	102.3	102.3	102.3	109.0	109.0	109.0	109.0
EC-i 30, 30 W	258	AEDL/HEDL	469/476	89.5	99.4	99.4	106.1	106.1	112.8	112.8	112.8	119.5	119.5	119.5	119.5
EC-i 30, 45 W	259			68.8	78.7	78.7	85.4	85.4	92.1	92.1	92.1	98.8	98.8	98.8	98.8
EC-i 30, 45 W	259	16 EASY/Abs.	449–453	80.5	90.4	90.4	97.1	97.1	103.8	103.8	103.8	110.5	110.5	110.5	110.5
EC-i 30, 45 W	259	16 RIO	466	79.0	88.9	88.9	95.6	95.6	102.3	102.3	102.3	109.0	109.0	109.0	109.0
EC-i 30, 45 W	259	AEDL/HEDL	469/476	89.5	99.4	99.4	106.1	106.1	112.8	112.8	112.8	119.5	119.5	119.5	119.5
EC-i 30, 50 W	260			90.8	100.7	100.7	107.4	107.4	114.1	114.1	114.1	120.8	120.8	120.8	120.8
EC-i 30, 50 W	260	16 EASY/Abs.	450–454	102.5	112.4	112.4	119.1	119.1	125.8	125.8	125.8	132.5	132.5	132.5	132.5
EC-i 30, 50 W	260	16 RIO	467	101.0	110.9	110.9	117.6	117.6	124.3	124.3	124.3	131.0	131.0	131.0	131.0
EC-i 30, 50 W	260	AEDL/HEDL	469/476	111.5	121.4	121.4	128.1	128.1	134.8	134.8	134.8	141.5	141.5	141.5	141.5
EC-i 30, 75 W	261			90.8	100.7	100.7	107.4	107.4	114.1	114.1	114.1	120.8	120.8	120.8	120.8
EC-i 30, 75 W	261	16 EASY/Abs.	450–454	102.5	112.4	112.4	119.1	119.1	125.8	125.8	125.8	132.5	132.5	132.5	132.5
EC-i 30, 75 W	261	16 RIO	467	101.0	110.9	110.9	117.6	117.6	124.3	124.3	124.3	131.0	131.0	131.0	131.0
EC-i 30, 75 W	261	AEDL/HEDL	469/476	111.5	121.4	121.4	128.1	128.1	134.8	134.8	134.8	141.5	141.5	141.5	141.5
EC-i 40, 50 W	262			58.3	68.2	68.2	74.9	74.9	81.6	81.6	81.6	88.3	88.3	88.3	88.3
EC-i 40, 50 W	262	16 EASY/Abs.	450–454	70.0	79.9	79.9	86.6	86.6	93.3	93.3	93.3	100.0	100.0	100.0	100.0
EC-i 40, 50 W	262	16 RIO	467	72.8	82.7	82.7	89.4	89.4	96.1	96.1	96.1	102.8	102.8	102.8	102.8
EC-i 40, 50 W	262	AEDL/HEDL	470/477	81.3	91.2	91.2	97.9	97.9	104.6	104.6	104.6	111.3	111.3	111.3	111.3
EC-i 40, 70 W	264			68.3	78.2	78.2	84.9	84.9	91.6	91.6	91.6	98.3	98.3	98.3	98.3
EC-i 40, 70 W	264	16 EASY/Abs.	450–454	80.0	89.9	89.9	96.6	96.6	103.3	103.3	103.3	110.0	110.0	110.0	110.0
EC-i 40, 70 W	264	16 RIO	467	82.8	92.7	92.7	99.4	99.4	106.1	106.1	106.1	112.8	112.8	112.8	112.8
EC-i 40, 70 W	264	AEDL/HEDL	470/477	91.3	101.2	101.2	107.9	107.9	114.6	114.6	114.6	121.3	121.3	121.3	121.3

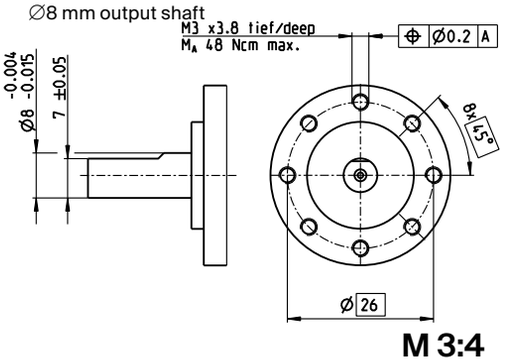
Planetary Gearhead GP 32 CR ∅32 mm, 1.0 Nm

for high radial loads, ceramic version

∅6 mm output shaft



∅8 mm output shaft

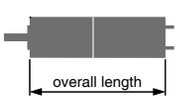


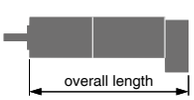
M 3:4

Technical Data		
Planetary Gearhead	straight teeth	
Output shaft	stainless steel	
Bearing at output	ball bearing	
Radial play, 5 mm from flange	max. 0.14 mm	
Axial play	max. 0.1 mm	
Max. axial load (dynamic)	120 N	
Max. force for press fits	120 N	
Direction of rotation, drive to output	=	
Max. continuous input speed	8000 rpm	
Recommended temperature range	-40...+100°C	
Output shaft diameter	6 mm	8 mm
Max. radial load, 10 mm from flange	140 N	120 N

Stock program
Standard program
Special program (on request)

Part Numbers	425240	425241	425242
Gearhead Data			
1 Reduction	3.7:1	4.8:1	5.8:1
2 Absolute reduction	26/7	24/5	23/4
3 Max. motor shaft diameter mm	6	4	3
Output shaft diameter mm	6	6	6
Part Numbers	413746	425160	425161
1 Reduction	3.7 : 1	4.8 : 1	5.8 : 1
2 Absolute reduction	26/7	24/5	23/4
3 Max. motor shaft diameter mm	6	4	3
Output shaft diameter mm	8	8	8
4 Number of stages	1	1	1
5 Max. continuous torque Nm	1.0	1.0	1.0
6 Max. intermittent torque at gear output Nm	1.25	1.25	1.25
7 Max. efficiency %	90	90	90
8 Weight g	111	111	111
9 Average backlash no load °	0.7	0.7	0.7
10 Mass inertia gcm^2	1.6	0.9	0.6
11 Gearhead length L1 mm	26.2	26.2	26.2



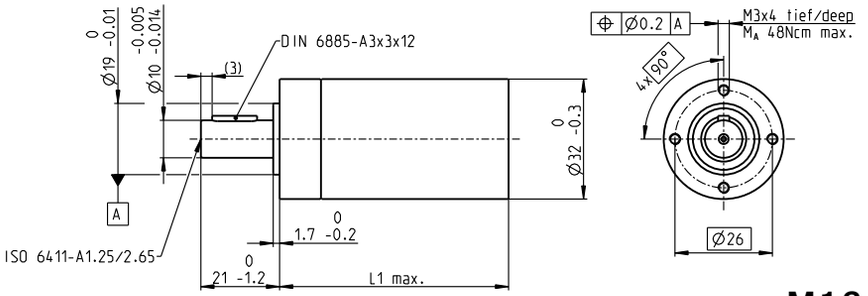


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts		
RE 30, 60 W	138			94.3	94.3	94.3
RE 30, 60 W	138	MR	464	105.7	105.7	105.7
RE 30, 60 W	138	HED_5540	471/473	115.1	115.1	115.1
RE 35, 90 W	139			97.3	97.3	97.3
RE 35, 90 W	139	MR	464	108.7	108.7	108.7
RE 35, 90 W	139	HED_5540	471/473	118.0	118.0	118.0
RE 35, 90 W	139	DCT 22	480	115.4	115.4	115.4
RE 35, 90 W	139	AB 28	519	133.4	133.4	133.4
RE 35, 90 W	139	HED_ 5540/AB 28	471/519	150.5	150.5	150.5
EC 32, 80 W	228			86.3	86.3	86.3
EC 32, 80 W	228	HED_5540	472/474	104.7	104.7	104.7
EC 32, 80 W	228	Res 26	481	106.4	106.4	106.4

Planetary Gearhead GP 32 HP ∅32 mm, 4.0–8.0 Nm

High Power



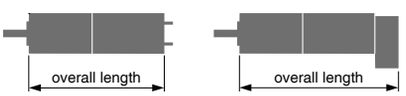
M 1:2

Technical Data	
Planetary Gearhead	straight teeth
Output shaft	stainless steel
Bearing at output	ball bearing
Radial play, 10 mm from flange	max. 0.14 mm
Axial play	max. 0.4 mm
Max. axial load (dynamic)	120 N
Max. force for press fits	120 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-40...+100°C
Number of stages	2 3 4
Max. radial load, 10 mm from flange	200 N 250 N 300 N

gear

Stock program
Standard program
Special program (on request)

Part Numbers	320247	326663	326664	326668	326672	324947	324952
Gearhead Data							
1 Reduction	14:1	33:1	51:1	111:1	190:1	456:1	706:1
2 Absolute reduction	$^{676}/_{49}$	$^{529}/_{16}$	$^{17576}/_{343}$	$^{13824}/_{125}$	$^{456976}/_{2401}$	$^{89401}/_{196}$	$^{158171}/_{224}$
3 Max. motor shaft diameter mm	6	3	6	4	6	3	3
Part Numbers	326659		326665	326669	324942	324948	324953
1 Reduction	18:1		66:1	123:1	246:1	492:1	762:1
2 Absolute reduction	$^{624}/_{35}$		$^{16224}/_{245}$	$^{6877}/_{56}$	$^{421824}/_{1715}$	$^{86112}/_{175}$	$^{19044}/_{25}$
3 Max. motor shaft diameter mm	6		6	3	6	6	4
Part Numbers	326660		**326666**	326670	324944	324949	324954
1 Reduction	21:1		79:1	132:1	295:1	531:1	913:1
2 Absolute reduction	$^{299}/_{14}$		$^{3887}/_{49}$	$^{3312}/_{25}$	$^{101062}/_{343}$	$^{331776}/_{625}$	$^{36501}/_{40}$
3 Max. motor shaft diameter mm	6		6	4	6	4	3
Part Numbers	326661		326667	326671	324945	324950	
1 Reduction	23:1		86:1	159:1	318:1	589:1	
2 Absolute reduction	$^{576}/_{25}$		$^{14976}/_{175}$	$^{1587}/_{10}$	$^{389376}/_{1225}$	$^{20631}/_{35}$	
3 Max. motor shaft diameter mm	4		6	3	6	6	
Part Numbers	326662		320297		324946	324951	
1 Reduction	28:1		103:1		411:1	636:1	
2 Absolute reduction	$^{138}/_{5}$		$^{3588}/_{35}$		$^{359424}/_{875}$	$^{79488}/_{125}$	
3 Max. motor shaft diameter mm	4		6		6	4	
4 Number of stages	2	2	3	3	4	4	4
5 Max. continuous torque Nm	4	4	8	8	8	8	8
6 Max. intermittent torque at gear output Nm	6	6	12	12	12	12	12
7 Max. efficiency %	75	75	70	70	60	60	60
8 Weight g	178	178	213	213	249	249	249
9 Average backlash no load °	0.8	0.8	1.0	1.0	1.0	1.0	1.0
10 Mass inertia gcm^2	1.6	0.5	1.5	0.7	1.5	1.5	0.7
11 Gearhead length L1 mm	48.3	48.3	55.0	55.0	61.7	61.7	61.7

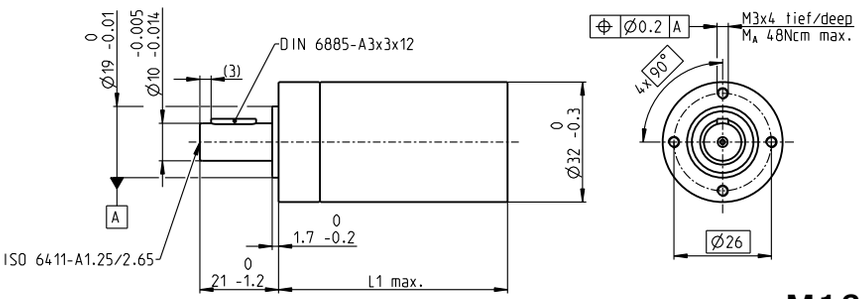


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor/brake) + assembly parts						
RE 35, 90 W	139			119.4	119.4	126.1	126.1	132.8	132.8	132.8
RE 35, 90 W	139	MR	464	130.8	130.8	137.5	137.5	144.2	144.2	144.0
RE 35, 90 W	139	HED_ 5540	471/473	140.1	140.1	146.8	146.8	153.5	153.5	153.5
RE 35, 90 W	139	DCT 22	480	137.5	137.5	144.2	144.2	150.9	150.9	150.9
RE 35, 90 W	139	AB 28	519	155.5	155.5	162.2	162.2	168.9	168.9	168.9
RE 35, 90 W	139	HEDS 5540/AB 28	471/519	172.7	172.7	179.4	179.4	186.1	186.1	186.1
EC-max 30, 40 W	240			90.2	90.2	96.9	96.9	103.6	103.6	103.6
EC-max 30, 40 W	240	MR	463	102.4	102.4	109.1	109.1	115.8	115.8	115.8
EC-max 30, 40 W	240	HEDL 5540	475	110.8	110.8	117.5	117.5	124.2	124.2	124.2
EC-max 30, 40 W	240	AB 20	516	125.8	125.8	132.5	132.5	139.2	139.2	139.2
EC-max 30, 40 W	240	HEDL 5540/AB 20	475/516	146.4	146.4	153.1	153.1	159.8	159.8	159.8
EC-max 30, 60 W	241			112.2	112.2	118.9	118.9	125.6	125.6	125.6
EC-max 30, 60 W	241	MR	463	124.4	124.4	131.1	131.1	137.8	137.8	137.8
EC-max 30, 60 W	241	HEDL 5540	475	132.8	132.8	139.5	139.5	146.2	146.2	146.2
EC-max 30, 60 W	241	AB 20	516	147.8	147.8	154.5	154.5	161.2	161.2	161.2
EC-max 30, 60 W	241	HEDL 5540/AB 20	475/516	168.4	168.4	175.1	175.1	181.8	181.8	181.8
EC-4pole 30, 100 W	249			95.2	95.2	101.9	101.9	108.6	108.6	108.6
EC-4pole 30, 100 W	249	16 EASY/XT/Abs.	449–453	109.1	109.1	115.8	115.8	122.5	122.5	122.5
EC-4pole 30, 100 W	249	16 EASY Abs. XT	455	109.6	109.6	116.3	116.3	123.0	123.0	123.0
EC-4pole 30, 100 W	249	16 RIO	466	107.6	107.6	114.3	114.3	121.0	121.0	121.0
EC-4pole 30, 100 W	249	AEDL/HEDL	469/475	115.8	115.8	122.5	122.5	129.2	129.2	129.2
EC-4pole 30, 100 W	249	AB 20	516	131.4	131.4	138.1	138.1	144.8	144.8	144.8
EC-4pole 30, 100 W	249	16 EASY/XT/Abs./AB 20	449/516	145.5	145.5	152.5	152.5	158.9	158.9	158.9
EC-4pole 30, 100 W	249	16 EASY Abs. XT/AB 20	455/516	146.0	146.0	153.0	153.0	159.4	159.4	159.4
EC-4pole 30, 100 W	249	16 RIO/AB 20	466/516	144.0	144.0	151.0	151.0	157.4	157.4	157.4
EC-4pole 30, 100 W	249	AEDL/HEDL/AB 20	469/516	152.2	152.2	158.9	158.9	165.6	165.6	165.6

Planetary Gearhead GP 32 HP ∅32 mm, 4.0–8.0 Nm

High Power

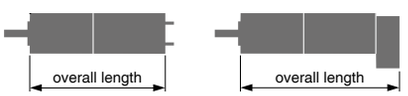


M 1:2

Technical Data	
Planetary Gearhead	straight teeth
Output shaft	stainless steel
Bearing at output	ball bearing
Radial play, 10 mm from flange	max. 0.14 mm
Axial play	max. 0.4 mm
Max. axial load (dynamic)	120 N
Max. force for press fits	120 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-40...+100°C
Number of stages	2 3 4
Max. radial load, 10 mm from flange	200 N 250 N 300 N

Stock program
Standard program
Special program (on request)

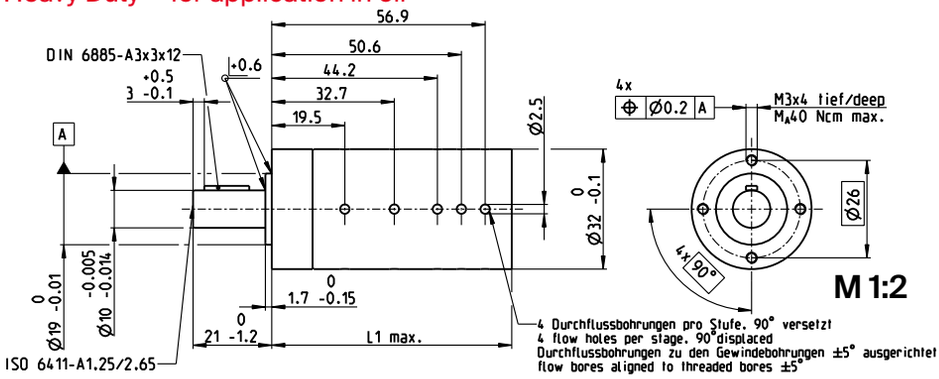
Part Numbers							
Gearhead Data	**320247**	326663	326664	326668	**326672**	324947	324952
1 Reduction	14:1	33:1	51:1	111:1	190:1	456:1	706:1
2 Absolute reduction	$^{676}/_{49}$	$^{529}/_{16}$	$^{17576}/_{343}$	$^{13824}/_{125}$	$^{456976}/_{2401}$	$^{89401}/_{196}$	$^{158171}/_{224}$
3 Max. motor shaft diameter mm	6	3	6	4	6	3	3
Part Numbers	326659		326665	326669	324942	324948	324953
1 Reduction	18:1		66:1	123:1	246:1	492:1	762:1
2 Absolute reduction	$^{624}/_{35}$		$^{16224}/_{245}$	$^{6877}/_{56}$	$^{421824}/_{1715}$	$^{86112}/_{175}$	$^{19044}/_{25}$
3 Max. motor shaft diameter mm	6		6	3	6	6	4
Part Numbers	326660		**326666**	326670	324944	324949	324954
1 Reduction	21:1		79:1	132:1	295:1	531:1	913:1
2 Absolute reduction	$^{299}/_{14}$		$^{3887}/_{49}$	$^{3312}/_{25}$	$^{101062}/_{343}$	$^{33176}/_{625}$	$^{3650}1/_{40}$
3 Max. motor shaft diameter mm	6		6	4	6	4	3
Part Numbers	326661		326667	326671	324945	324950	
1 Reduction	23:1		86:1	159:1	318:1	589:1	
2 Absolute reduction	$^{576}/_{25}$		$^{14976}/_{175}$	$^{1587}/_{10}$	$^{389376}/_{1225}$	$^{20631}/_{35}$	
3 Max. motor shaft diameter mm	4		6	3	6	6	
Part Numbers	326662		320297		324946	324951	
1 Reduction	28:1		103:1		411:1	636:1	
2 Absolute reduction	$^{138}/_{5}$		$^{3588}/_{35}$		$^{359424}/_{875}$	$^{79488}/_{125}$	
3 Max. motor shaft diameter mm	4		6		6	4	
4 Number of stages	2	2	3	3	4	4	4
5 Max. continuous torque Nm	4	4	8	8	8	8	8
6 Max. intermittent torque at gear output Nm	6	6	12	12	12	12	12
7 Max. efficiency %	75	75	70	70	60	60	60
8 Weight g	178	178	213	213	249	249	249
9 Average backlash no load °	0.8	0.8	1.0	1.0	1.0	1.0	1.0
10 Mass inertia gcm^2	1.6	0.5	1.5	0.7	1.5	1.5	0.7
11 Gearhead length L1 mm	48.3	48.3	55.0	55.0	61.7	61.7	61.7



maxon Modular System									
+ Motor	Page	**+ Sensor/Brake**	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor/brake) + assembly parts						
EC-4pole 30, 200 W	251			112.2	112.2	118.9	118.9	125.6	125.6	125.6
EC-4pole 30, 200 W	251	16 EASY/XT/Abs.	449/453	126.1	126.1	132.8	132.8	139.5	139.5	139.5
EC-4pole 30, 200 W	251	16 EASY Abs. XT	455	126.6	126.6	133.3	133.3	140.0	140.0	140.0
EC-4pole 30, 200 W	251	16 RIO	466	124.6	124.4	131.3	131.3	138.0	138.0	138.0
EC-4pole 30, 200 W	251	HEDL 5540	475	132.8	132.8	139.5	139.5	146.2	146.2	146.2
EC-4pole 30, 200 W	251	AB 20	516	148.4	148.4	155.1	155.1	161.8	161.8	161.8
EC-4pole 30, 200 W	251	16 EASY/XT/Abs./AB 20	449/516	162.5	162.5	169.2	169.2	175.9	175.9	175.9
EC-4pole 30, 200 W	251	16 EASY Abs. XT/AB 20	455/516	163.0	163.0	169.7	169.7	176.4	176.4	176.4
EC-4pole 30, 200 W	251	16 RIO/AB 20	466/516	161.0	161.0	167.7	167.7	174.4	174.4	174.4
EC-4pole 30, 200 W	251	HEDL 5540/AB 20	475/516	169.2	169.2	175.9	175.9	182.6	182.6	182.6

Planetary Gearhead GP 32 HD ∅32 mm, 3.0–8.0 Nm

Heavy Duty – for application in oil



Technical Data	
Planetary Gearhead	straight teeth
Output shaft	stainless steel
Bearing at output	ball bearing
Radial play, 10 mm from flange	max. 0.14 mm
Axial play	max. 0.4 mm
Max. axial load (dynamic)	120 N
Max. force for press fits	120 N
Direction of rotation, drive to output	=
Max. continuous input speed	< 8000 rpm
Recommended temperature range	-55...+200°C
Extended range as option	-55...+260°C

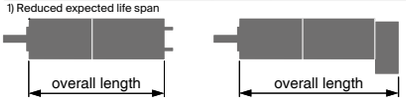
Number of stages	1	2	3	4	5
Max. radial load, 10 mm from flange	120 N	200 N	250 N	300 N	300 N

gear

Stock program
Standard program
Special program (on request)

Gearhead Data (provisional)		Part Numbers									
		526077	526080	526086	526092	526095	526101	526106	526112	526117	526123
1	Reduction	3.7:1	14:1	51:1	123:1	190:1	492:1	707:1	1694:1	2548:1	4060:1
2	Absolute reduction	26/7	676/49	17576/343	6877/56	456976/2401	86112/175	11881376/16807	1162213/686	7962624/3125	3637933/896
3	Max. motor shaft diameter mm	6	6	6	3	6	6	6	6	4	6
	Part Numbers	526078	526081	526087	526093	526096	526102	526107	526113	526118	526124
1	Reduction	4.8:1	18:1	66:1	132:1	246:1	531:1	914:1	1828:1	2623:1	4380:1
2	Absolute reduction	24/5	624/35	16224/245	3312/25	421824/1715	331776/625	10967424/12005	2238912/1225	2056223/784	109503/25
3	Max. motor shaft diameter mm	4	6	6	4	6	4	6	6	6	4
	Part Numbers	526079*	526082	526088	526094*	526097	526103	526108	526114	526119	526125
1	Reduction	5.8:1	21:1	79:1	159:1	295:1	589:1	1094:1	1972:1	2829:1	5247:1
2	Absolute reduction	23/4	299/14	3887/49	1587/10	101062/343	20631/35	2627612/2401	8626176/4375	495144/175	839523/160
3	Max. motor shaft diameter mm	3	6	6	3	6	6	6	4	6	4
	Part Numbers		526083	526089		526098	526104	526109	526115	526120	526126*
1	Reduction		23:1	86:1		318:1	636:1	1181:1	2189:1	3052:1	6285:1
2	Absolute reduction		576/25	14976/175		389376/1225	79488/125	10123776/8575	536406/245	1907712/625	6436343/1024
3	Max. motor shaft diameter mm		4	6		6	4	6	6	4	3
	Part Numbers		526084	526090		526099	526105	526110	526116	526121	
1	Reduction		28:1	103:1		411:1	762:1	1414:1	2362:1	3389:1	
2	Absolute reduction		138/5	3588/35		359424/875	19044/25	2425488/1715	2066688/875	474513/140	
3	Max. motor shaft diameter mm		4	6		6	4	6	6	6	
	Part Numbers		526085*	526091		526100		526111		526122	
1	Reduction		33:1	111:1		456:1		1526:1		3656:1	
2	Absolute reduction		529/16	13824/125		89401/196		9345024/6125		457056/125	
3	Max. motor shaft diameter mm		3	4		6		4		4	
4	Number of stages	1	2	3	3	4	4	5	5	5	5
5	Max. continuous torque Nm	3	4	8	8	8	8	8	8	8	8
6	Max. intermittent torque at gear output Nm	4.5	6	12	12	12	12	12	12	12	12
15	Max. overload torque[1] Nm	9	12	24	24	24	24	24	24	24	24
7	Max. efficiency %	95	87	78	78	65	65	53	53	53	53
8	Weight g	176	234	277	277	309	309	340	340	340	340
9	Average backlash no load °	0.7	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
10	Mass inertia gcm^2	1.59	1.59	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45
11	Gearhead length L1 mm	32.9	45.3	55.1	55.1	61.6	61.6	68.1	68.1	68.1	68.1
13	Max. transmittable power (continuous) W	320	200	80	80	40	40	12	12	12	12
14	Max. transmittable power (intermittent) W	480	300	120	120	60	60	18	18	18	18

1) Reduced expected life span



maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts									
EC-4pole 32 HD oil, A	253			194.0	206.5	216.5	216.5	223.0	223.0	229.5	229.5	229.5	229.5
EC-4pole 32 HD oil, B	253			174.0	186.5	196.5	196.5	203.0	203.0	209.5	209.5	209.5	209.5

*Overall length + 2 mm

Application

General
- extreme temperature applications
- vibration tested according to MIL-STD810F/ Jan2000 Fig. 514.5C-10
- operation in oil and high pressure

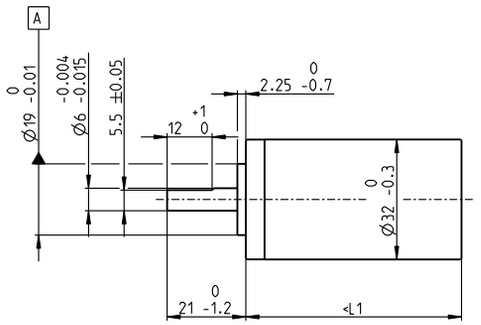
Oil & Gas Industry
- oil, gas and geothermal wells

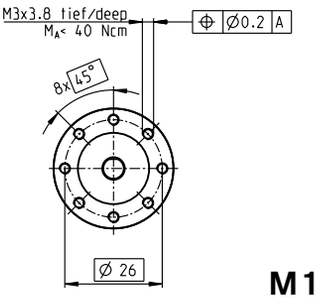
Important Notice

This gearhead has been designed for applications in oil and is only equipped with minimum lubrication. Therefore it is not permitted to use it under normal air conditions.

Koaxdrive KD 32 ∅32 mm, 1.0–4.5 Nm

Low Noise





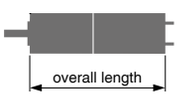
M 1:2

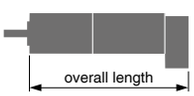
Technical Data	
Planetary Gearhead	special toothing
Output shaft	stainless steel
Bearing at output	ball bearing
Radial play, 5 mm from flange	max. 0.14 mm
Axial play	max. 0.4 mm
Max. axial load (dynamic)	120 N
Max. force for press fits	120 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-15...+80°C
Number of stages	1 2 3
Max. radial load, 10 mm from flange	90 N 140 N 200 N

Option: higher reduction ratio on request

Stock program
Standard program
Special program (on request)

Part Numbers	354722	354725	354962	354730	354731	354734	354737	354963	354742
Gearhead Data									
1 Reduction	11:1	41:1	82:1	158:1	152:1	253:1	392:1	705:1	1091:1
2 Absolute reduction	11/1	286/7	408/5	792/5	7436/49	6336/25	9792/25	9867/14	17457/16
7 Max. efficiency %	78	70	65	61	63	63	59	55	55
10 Mass inertia gcm²	0.65	0.60	0.60	0.35	0.60	0.60	0.35	0.35	0.22
Part Numbers	354723	354726	354728	354744	354732	354735	354738	354740	
1 Reduction	17:1	53:1	98:1	190:1	196:1	304:1	455:1	760:1	
2 Absolute reduction	17/1	264/5	391/4	759/4	6864/35	1518/5	22308/49	19008/25	
7 Max. efficiency %	72	70	65	65	63	63	55	55	
10 Mass inertia gcm²	0.38	0.60	0.35	0.35	0.60	0.60	0.22	0.22	
Part Numbers	354724	354727	354729		354733	354736	354739	354741	
1 Reduction	33:1	63:1	123:1		235:1	364:1	588:1	911:1	
2 Absolute reduction	33/1	442/7	858/7		11492/49	5819/16	20592/35	4554/5	
7 Max. efficiency %	68	70	61		63	63	59	55	
10 Mass inertia gcm²	0.65	0.60	0.22		0.60	0.60	0.35	0.22	
3 Max. motor shaft diameter mm	3	3	3	3	3	3	3	3	3
4 Number of stages	1	2	2	2	3	3	3	3	3
5 Max. continuous torque Nm	1	3.5	3.5	3.5	4.5	4.5	4.5	4.5	4.5
6 Max. intermittent torque at gear output Nm	1.25	4.4	4.4	4.4	6.5	6.5	6.5	6.5	6.5
8 Weight g	130	230	230	230	262	262	262	262	262
9 Average backlash no load °	3.5	1	1	1	1	1	1	1	1
11 Gearhead length L1 mm	40.7	57.9	57.9	57.9	67.6	67.6	67.6	67.6	67.6

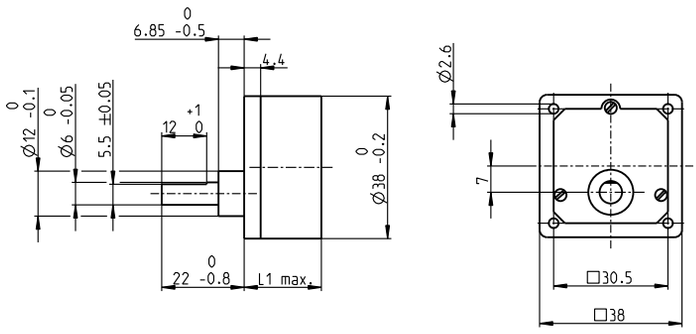




maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor/brake) + assembly parts								
RE 25	134/136			95.3	112.5	112.5	112.5	122.2	122.2	122.2	122.2	122.2
RE 25	134/136	MR	463	106.3	123.5	123.5	123.5	133.2	133.2	133.2	133.2	133.2
RE 25	134/136	Enc 22	468	109.4	126.6	126.6	126.6	136.3	136.3	136.3	136.3	136.3
RE 25	134/136	HED_5540	471/473	116.1	133.3	133.3	133.3	143.0	143.0	143.0	143.0	143.0
RE 25	134/136	DCT 22	480	117.6	134.8	134.8	134.8	144.5	144.5	144.5	144.5	144.5
RE 25, 20 W	135			83.8	101.0	101.0	101.0	110.7	110.7	110.7	110.7	110.7
RE 25, 20 W	135	MR	463	94.8	112.0	112.0	112.0	121.7	121.7	121.7	121.7	121.7
RE 25, 20 W	135	HED_5540	472/473	104.6	121.8	121.8	121.8	131.5	131.5	131.5	131.5	131.5
RE 25, 20 W	135	DCT 22	480	106.1	123.3	123.3	123.3	133.0	133.0	133.0	133.0	133.0
RE 25, 20 W	135	AB 28	519	117.9	135.1	135.1	135.1	144.8	144.8	144.8	144.8	144.8
RE 25, 20 W	135	HED_5540/AB 28	472/519	135.1	152.3	152.3	152.3	162.0	162.0	162.0	162.0	162.0
RE 30, 60 W	138			108.8	126.0	126.0	126.0	135.7	135.7	135.7	135.7	135.7
RE 30, 60 W	138	MR	464	120.2	137.4	137.4	137.4	147.1	147.1	147.1	147.1	147.1
RE 30, 60 W	138	HEDL 5540	473	129.6	146.8	146.8	146.8	156.5	156.5	156.5	156.5	156.5
EC-max 22, 12 W	238			72.8	90.0	90.0	90.0	99.7	99.7	99.7	99.7	99.7
EC-max 22, 12 W	238	MR	462	82.4	99.6	99.6	99.6	109.3	109.3	109.3	109.3	109.3
EC-max 22, 12 W	238	AB 20	516	108.4	125.6	125.6	125.6	135.3	135.3	135.3	135.3	135.3
EC-max 22, 25 W	239			89.3	106.5	106.5	106.5	116.2	116.2	116.2	116.2	116.2
EC-max 22, 25 W	239	MR	462	98.9	116.1	116.1	116.1	125.8	125.8	125.8	125.8	125.8
EC-max 22, 25 W	239	AB 20	516	125.0	142.2	142.2	142.2	151.9	151.9	151.9	151.9	151.9
EC-max 30, 40 W	240			82.8	100.0	100.0	100.0	109.7	109.7	109.7	109.7	109.7
EC-max 30, 40 W	240	MR	463	95.0	112.2	112.2	112.2	121.9	121.9	121.9	121.9	121.9
EC-max 30, 40 W	240	HEDL 5540	475	103.4	120.6	120.6	120.6	130.3	130.3	130.3	130.3	130.3
EC-max 30, 40 W	240	AB 20	516	118.4	135.6	135.6	135.6	145.3	145.3	145.3	145.3	145.3
EC-max 30, 40 W	240	HEDL 5540/AB 20	475/516	139.2	156.2	156.2	156.2	165.8	165.8	165.8	165.8	165.8
EC-max 30, 60 W	241			104.8	122.0	122.0	122.0	131.7	131.7	131.7	131.7	131.7
EC-max 30, 60 W	241	MR	463	117.0	134.2	134.2	134.2	143.9	143.9	143.9	143.9	143.9
EC-max 30, 60 W	241	HEDL 5540	475	125.4	142.6	142.6	142.6	152.3	152.3	152.3	152.3	152.3
EC-max 30, 60 W	241	AB 20	516	140.4	157.6	157.6	157.6	167.3	167.3	167.3	167.3	167.3
EC-max 30, 60 W	241	HEDL 5540/AB 20	475/516	161.2	178.2	178.2	178.2	187.8	187.8	187.8	187.8	187.8

Spur Gearhead GS 38 A ∅38 mm, 0.1–0.6 Nm



M 1:2

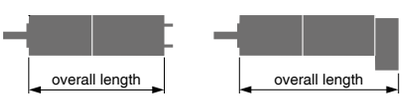
Technical Data	
Spur Gearhead	straight teeth
Output shaft	stainless steel
Bearing at output	sleeve bearing
Radial play, 12 mm from flange	max. 0.1 mm
Axial play	0.03–0.2 mm
Max. axial load (dynamic)	30 N
Max. force for press fits	500 N
Max. continuous input speed	5000 rpm
Recommended temperature range	-5...+80°C

Number of stages	1	2	3	4	5
Max. radial load, 12 mm from flange	50 N	50 N	50 N	50 N	50 N

Stock program
Standard program
Special program (on request)

Part Numbers	110451	110452	110453	110454	110455	110456	110457	110458	110459
Gearhead Data									
1 Reduction	6:1	10:1	18:1	30:1	60:1	100:1	200:1	500:1	900:1
2 Absolute reduction	6	10	18	30	60	100	200	500	900
3 Max. motor shaft diameter mm	3	3	3	3	3	3	3	3	3
4 Number of stages	2	2	3	3	4	4	5	6	6
5 Max. continuous torque Nm	0.1	0.1	0.2	0.2	0.3	0.3	0.6	0.6	0.6
6 Max. intermittent torque at gear output Nm	0.3	0.3	0.6	0.6	0.9	0.9	1.8	1.8	1.8
12 Direction of rotation, drive to output	=	=	≠	≠	=	=	≠	=	=
7 Max. efficiency %	81	81	73	73	66	66	59	53	53
8 Weight g	55	55	60	60	65	65	70	75	75
9 Average backlash no load °	1.0	1.0	1.5	1.5	2.0	2.0	2.5	3.0	3.0
10 Mass inertia gcm^2	0.7	0.6	0.4	0.4	0.3	0.3	0.2	0.2	0.2
11 Gearhead length L1* mm	20.6	20.6	23.1	23.1	25.6	25.6	28.1	30.6	30.6

*for EC 32 flat L1 is + 2.0 mm

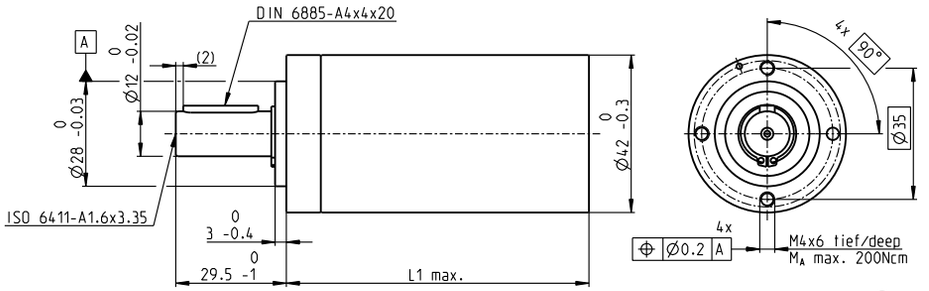


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor/brake) + assembly parts								
A-max 26	161-164			65.4	65.4	67.9	67.9	70.4	70.4	72.9	75.4	75.4
A-max 26	162-164	MR	463	74.2	74.2	76.7	76.7	79.2	79.2	81.7	84.2	84.2
A-max 26	162-164	Enc 22	468	79.8	79.8	82.3	82.3	84.8	84.8	87.3	89.8	89.8
A-max 26	162-164	HED_ 5540	472/474	83.8	83.8	86.3	86.3	88.8	88.8	91.3	93.8	93.8
A-max 32	165			83.6	83.6	86.1	86.1	88.6	88.6	91.1	93.6	93.6
A-max 32	166			82.2	82.2	84.7	84.7	87.2	87.2	89.7	92.2	92.2
A-max 32	166	MR	464	93.4	93.4	95.9	95.9	98.4	98.4	100.9	103.4	103.4
A-max 32	166	HED_ 5540	472/474	103.0	103.0	105.5	105.5	108.0	108.0	110.5	113.0	113.0
EC 32 flat, 15 W	282			38.6	38.6	41.1	41.1	43.6	43.6	46.1	48.6	48.6
EC 32 flat, IE, IP 00	283			48.7	48.7	51.2	51.2	53.7	53.7	56.2	58.7	58.7
EC 32 flat, IE, IP 40	283			50.4	50.4	52.9	52.9	55.4	55.4	57.9	60.4	60.4

Planetary Gearhead GP 42 C ∅42 mm, 3.0–15.0 Nm

Ceramic Version



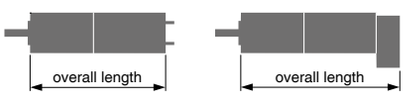
M 1:2

Technical Data	
Planetary Gearhead	straight teeth
Output shaft	stainless steel
Bearing at output	preloaded ball bearings
Radial play, 12 mm from flange	max. 0.06 mm
Axial play at axial load	< 5 N 0 mm
	> 5 N max. 0.3 mm
Max. axial load (dynamic)	150 N
Max. force for press fits	300 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-40...+100°C
Number of stages	1 2 3 4
Max. radial load, 12 mm from flange	120 N 240 N 360 N 360 N

Stock program
Standard program
Special program (on request)

Part Numbers										
	203113	203115	203119	203120	203124	203129	203128	203133	203137	203141
Gearhead Data										
1 Reduction	3.5:1	12:1	26:1	43:1	81:1	156:1	150:1	285:1	441:1	756:1
2 Absolute reduction	7/2	49/4	26	343/8	2197/27	156	2401/16	15379/54	441	756
10 Mass inertia gcm²	14	15	9.1	15	9.4	9.1	15	15	14	14
3 Max. motor shaft diameter mm	10	10	8	10	8	8	10	10	10	10
Part Numbers	**203114**	**203116**	260552*	203121	203125	260553*	203130	203134	203138	203142
1 Reduction	4.3:1	15:1	36:1	53:1	91:1	216:1	186:1	319:1	488:1	936:1
2 Absolute reduction	13/3	91/6	36/1	637/12	91	216/1	4459/24	637/2	4394/9	936
10 Mass inertia gcm²	9.1	15	5.0	15	15	5.0	15	15	9.4	9.1
3 Max. motor shaft diameter mm	8	10	4	10	10	4	10	10	8	8
Part Numbers	260551*	203117		203122	203126		203131	203135	203139	260554*
1 Reduction	6:1	19:1		66:1	113:1		230:1	353 :1	546:1	1296:1
2 Absolute reduction	6/1	169/9		1183/18	338/3		8281/36	2856/81	546	1296/1
10 Mass inertia gcm²	4.9	9.4		15	9.4		15	9.4	14	5.0
3 Max. motor shaft diameter mm	4	8		10	8		10	8	10	4
Part Numbers		203118		203123	203127		203132	203136	203140	
1 Reduction		21:1		74:1	126:1		257:1	394:1	676:1	
2 Absolute reduction		21		147/2	126		1029/4	1183/3	676	
10 Mass inertia gcm²		14		15	14		15	15	9.1	
3 Max. motor shaft diameter mm		10		10	10		10	10	8	
4 Number of stages	1	2	2	3	3	3	4	4	4	4
5 Max. continuous torque Nm	3.0	7.5	7.5	15.0	15.0	15.0	15.0	15.0	15.0	15.0
6 Max. intermittent torque at gear output Nm	4.5	11.3	11.3	22.5	22.5	22.5	22.5	22.5	22.5	22.5
7 Max. efficiency %	90	81	81	72	72	72	64	64	64	64
8 Weight g	260	360	360	460	460	460	560	560	560	560
9 Average backlash no load °	0.6	0.8	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0
11 Gearhead length L1** mm	41.0	55.5	55.5	70.0	70.0	70.0	84.5	84.5	84.5	84.5

*no combination with EC 45 (150/250 W) and EC-i 40
**for EC 45 flat L1 is -3.6 mm

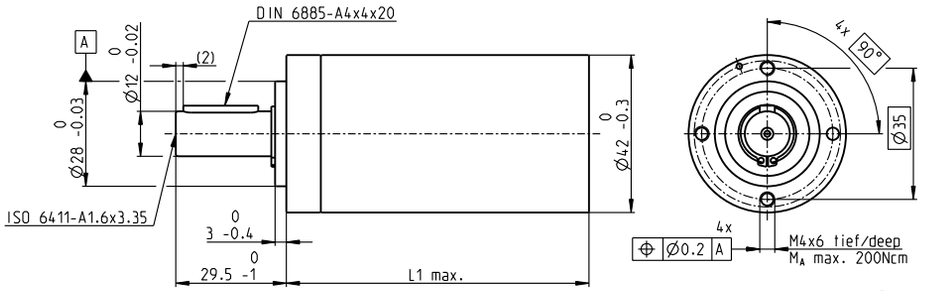


maxon Modular System

+ Motor	Page	+ Sensor	Page	Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts									
RE 35, 90 W	139					112.1	126.6	126.6	141.1	141.1	141.1	155.6	155.6	155.6	155.6
RE 35, 90 W	139	MR	464			123.5	138.0	138.0	152.5	152.5	152.5	167.0	167.0	167.0	167.0
RE 35, 90 W	139	HED_5540	471/473			132.8	147.3	147.3	161.8	161.8	161.8	176.3	176.3	176.3	176.3
RE 35, 90 W	139	DCT 22	480			130.2	144.7	144.7	159.2	159.2	159.2	173.7	173.7	173.7	173.7
RE 35, 90 W	139			AB 28	519	148.2	162.7	162.7	177.2	177.2	177.2	191.7	191.7	191.7	191.7
RE 35, 90 W	139	HED_5540	471/473	AB 28	519	165.4	179.9	179.9	194.4	194.4	194.4	208.9	208.9	208.9	208.9
RE 40, 150 W	141					112.1	126.6	126.6	141.1	141.1	141.1	155.6	155.6	155.6	155.6
RE 40, 150 W	141	MR	464			123.5	138.0	138.0	152.5	152.5	152.5	167.0	167.0	167.0	167.0
RE 40, 150 W	141	HED_5540	471/474			132.8	147.3	147.3	161.8	161.8	161.8	176.3	176.3	176.3	176.3
RE 40, 150 W	141	HEDL 9140	478			166.2	180.7	180.7	195.2	195.2	195.2	209.7	209.7	209.7	209.7
RE 40, 150 W	141			AB 28	519	148.2	162.7	162.7	177.2	177.2	177.2	191.7	191.7	191.7	191.7
RE 40, 150 W	141			AB 28	520	156.2	170.7	170.7	185.2	185.2	185.2	199.7	199.7	199.7	199.7
RE 40, 150 W	141	HED_ 5540	471/474	AB 28	519	165.4	179.9	179.9	194.4	194.4	194.4	208.9	208.9	208.9	208.9
RE 40, 150 W	141	HEDL 9140	478	AB 28	520	176.7	191.2	191.2	205.7	205.7	205.7	220.2	220.2	220.2	220.2
EC 40, 170 W	229					121.1	135.6	135.6	150.1	150.1	150.1	164.6	164.6	164.6	164.6
EC 40, 170 W	229	HED_5540	472/474			144.5	159.0	159.0	173.5	173.5	173.5	188.0	188.0	188.0	188.0
EC 40, 170 W	229	Res 26	481			148.3	162.8	162.8	177.3	177.3	177.3	191.8	191.8	191.8	191.8
EC 40, 170 W	229			AB 32	521	163.8	178.3	178.3	192.8	192.8	192.8	207.3	207.3	207.3	207.3
EC 40, 170 W	229	HED_5540	472/474	AB 32	521	182.2	196.7	196.7	211.2	211.2	211.2	225.7	225.7	225.7	225.7
EC 45, 150 W	230					152.3	166.8	166.8	181.3	181.3	181.3	195.8	195.8	195.8	195.8
EC 45, 150 W	230	HEDL 9140	478			167.9	182.4	182.4	196.9	196.9	196.9	211.4	211.4	211.4	211.4
EC 45, 150 W	230	Res 26	481			152.3	166.8	166.8	181.3	181.3	181.3	195.8	195.8	195.8	195.8
EC 45, 150 W	230			AB 28	520	159.7	174.2	174.2	188.7	188.7	188.7	203.2	203.2	203.2	203.2
EC 45, 150 W	230	HEDL 9140	478	AB 28	520	176.7	191.2	191.2	205.7	205.7	205.7	220.2	220.2	220.2	220.2
EC 45, 250 W	231					185.1	199.6	199.6	214.1	214.1	214.1	228.6	228.6	228.6	228.6
EC 45, 250 W	231	HEDL 9140	478			200.7	215.2	215.2	229.7	229.7	229.7	244.2	244.2	244.2	244.2
EC 45, 250 W	231	Res 26	481			185.1	199.6	199.6	214.1	214.1	214.1	228.6	228.6	228.6	228.6
EC 45, 250 W	231			AB 28	520	192.5	207.0	207.0	221.5	221.5	221.5	236.0	236.0	236.0	236.0
EC 45, 250 W	231	HEDL 9140	478	AB 28	520	209.5	224.0	224.0	238.5	238.5	238.5	253.0	253.0	253.0	253.0

Planetary Gearhead GP 42 C ∅42 mm, 3.0–15.0 Nm

Ceramic Version



M 1:2

Technical Data

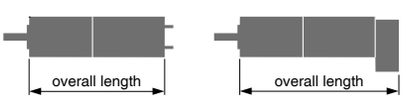
Planetary Gearhead	straight teeth
Output shaft	stainless steel
Bearing at output	preloaded ball bearings
Radial play, 12 mm from flange	max. 0.06 mm
Axial play at axial load	< 5 N 0 mm
	> 5 N max. 0.3 mm
Max. axial load (dynamic)	150 N
Max. force for press fits	300 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-40...+100°C
Number of stages	1 2 3 4
Max. radial load, 12 mm from flange	12720 N240 N360 N 360 N

gear

Stock program
Standard program
Special program (on request)

Part Numbers	203113	203115	203119	203120	203124	203129	203128	203133	203137	203141
Gearhead Data										
1 Reduction	3.5:1	12:1	26:1	43:1	81:1	156:1	150:1	285:1	441:1	756:1
2 Absolute reduction	7/2	49/4	26	343/8	2197/27	156	2401/16	15379/54	441	756
10 Mass inertia gcm²	14	15	9.1	15	9.4	9.1	15	15	14	14
3 Max. motor shaft diameter mm	10	10	8	10	8	8	10	10	10	10
Part Numbers	**203114**	**203116**	260552*	203121	203125	260553*	203130	203134	203138	203142
1 Reduction	4.3:1	15:1	36:1	53:1	91:1	216:1	186:1	319:1	488:1	936:1
2 Absolute reduction	13/3	91/6	36/1	637/12	91	216/1	4459/24	637/2	4394/9	936
10 Mass inertia gcm²	9.1	15	5.0	15	15	5.0	15	15	9.4	9.1
3 Max. motor shaft diameter mm	8	10	4	10	10	4	10	10	8	8
Part Numbers	260551*	203117		203122	203126		203131	203135	203139	260554*
1 Reduction	6:1	19:1		66:1	113:1		230:1	353:1	546:1	1296:1
2 Absolute reduction	6/1	169/9		1183/18	338/3		8281/36	28561/81	546	1296/1
10 Mass inertia gcm²	4.9	9.4		15	9.4		15	9.4	14	5.0
3 Max. motor shaft diameter mm	4	8		10	8		10	8	10	4
Part Numbers		203118		203123	203127		203132	203136	203140	
1 Reduction		21:1		74:1	126:1		257:1	394:1	676:1	
2 Absolute reduction		21		147/2	126		1029/4	1183/3	676	
10 Mass inertia gcm²		14		15	14		15	15	9.1	
3 Max. motor shaft diameter mm		10		10	10		10	10	8	
4 Number of stages	1	2	2	3	3	3	4	4	4	4
5 Max. continuous torque Nm	3.0	7.5	7.5	15.0	15.0	15.0	15.0	15.0	15.0	15.0
6 Max. intermittent torque at gear output Nm	4.5	11.3	11.3	22.5	22.5	22.5	22.5	22.5	22.5	22.5
7 Max. efficiency %	90	81	81	72	72	72	64	64	64	64
8 Weight g	260	360	360	460	460	460	560	560	560	560
9 Average backlash no load °	0.6	0.8	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0
11 Gearhead length L1** mm	41.0	55.5	55.5	70.0	70.0	70.0	84.5	84.5	84.5	84.5

*no combination with EC 45 (150/250 W) and EC-i 40
**for EC 45 flat L1 is -3.6 mm

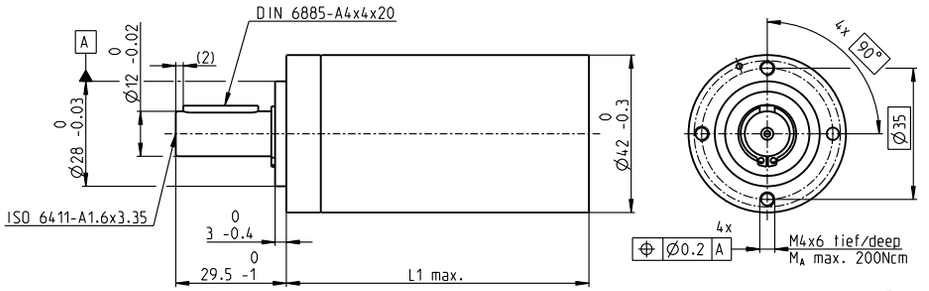


maxon Modular System

+ Motor	Page	+ Sensor	Page	Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts									
EC-max 30, 60 W	241					105.1	119.6	119.6	134.1	134.1	134.1	148.6	148.6	148.6	148.6
EC-max 30, 60 W	241	MR	463			117.3	131.8	131.8	146.3	146.3	146.3	160.8	160.8	160.8	160.8
EC-max 30, 60 W	241	HEDL 5540	475			125.7	140.2	140.2	154.7	154.7	154.7	169.2	169.2	169.2	169.2
EC-max 30, 60 W	241			AB 20	516	141.2	155.1	155.1	169.5	169.5	169.5	184.2	184.2	184.2	184.2
EC-max 30, 60 W	241	HEDL 5540	475	AB 20	516	161.4	175.9	175.9	190.4	190.4	190.4	204.9	204.9	204.9	204.9
EC-max 40, 70 W	242					99.1	113.6	113.6	128.1	128.1	128.1	142.6	142.6	142.6	142.6
EC-max 40, 70 W	242	MR	464			115.0	129.5	129.5	144.0	144.0	144.0	158.5	158.5	158.5	158.5
EC-max 40, 70 W	242	HEDL 5540	475			122.5	137.0	137.0	151.5	151.5	151.5	166.0	166.0	166.0	166.0
EC-max 40, 70 W	242			AB 28	518	133.5	148.0	148.0	162.5	162.5	162.5	177.0	177.0	177.0	177.0
EC-max 40, 70 W	242	HEDL 5540	475	AB 28	518	151.8	166.3	166.3	180.8	180.8	180.8	195.3	195.3	195.3	195.3
EC-4pole 30, 100 W	249					88.1	102.6	102.6	117.1	117.1	117.1	131.6	131.6	131.6	131.6
EC-4pole 30, 100 W	249	16 EASY/XT/Abs.	449–453			102.0	116.5	116.5	131.0	131.0	131.0	145.5	145.5	145.5	145.5
EC-4pole 30, 100 W	249	16 EASY Abs. XT	455			102.5	117.0	117.0	131.5	131.5	131.5	146.0	146.0	146.0	146.0
EC-4pole 30, 100 W	249	16 RIO	466			100.5	115.0	115.0	129.5	129.5	129.5	144.0	144.0	144.0	144.0
EC-4pole 30, 100 W	249	AEDL/HEDL	469/475			108.7	123.2	123.2	137.7	137.7	137.7	152.2	152.2	152.2	152.2
EC-4pole 30, 100 W	249			AB 20	516	124.3	138.8	138.8	153.3	153.3	153.3	167.8	167.8	167.8	167.8
EC-4pole 30, 100 W	249	16 EASY/XT/Abs.	449–453	AB 20	516	138.4	152.9	152.9	167.4	167.4	167.4	181.9	181.9	181.9	181.9
EC-4pole 30, 100 W	249	16 EASY Abs. XT	455	AB 20	516	138.9	153.4	153.4	167.9	167.9	167.9	182.4	182.4	182.4	182.4
EC-4pole 30, 100 W	249	16 RIO	466	AB 20	516	136.9	151.4	151.4	165.9	165.9	165.9	180.4	180.4	180.4	180.4
EC-4pole 30, 100 W	249	AEDL/HEDL	469/475	AB 20	516	145.1	159.6	159.6	174.1	174.1	174.1	188.6	188.6	188.6	188.6
EC-4pole 30, 200 W	251					105.1	119.6	119.6	134.1	134.1	134.1	148.6	148.6	148.6	148.6
EC-4pole 30, 200 W	251	16 EASY/XT/Abs.	449–453			119.0	133.5	133.5	148.0	148.0	148.0	162.5	162.5	162.5	162.5
EC-4pole 30, 200 W	251	16 EASY Abs. XT	455			119.5	134.0	134.0	148.5	148.5	148.5	163.0	163.0	163.0	163.0
EC-4pole 30, 200 W	251	16 RIO	466			117.5	132.0	132.0	146.5	146.5	146.5	161.0	161.0	161.0	161.0
EC-4pole 30, 200 W	251	AEDL/HEDL	469/475			125.7	140.2	140.2	154.7	154.7	154.7	169.2	169.2	169.2	169.2
EC-4pole 30, 200 W	251			AB 20	516	141.3	155.8	155.8	170.3	170.3	170.3	184.8	184.8	184.8	184.8
EC-4pole 30, 200 W	251	16 EASY/XT/Abs.	449–453	AB 20	516	155.4	169.9	169.9	184.4	184.4	184.4	198.9	198.9	198.9	198.9
EC-4pole 30, 200 W	251	16 EASY Abs. XT	455	AB 20	516	155.9	170.4	170.4	184.9	184.9	184.9	199.4	199.4	199.4	199.4

Planetary Gearhead GP 42 C ∅42 mm, 3.0–15.0 Nm

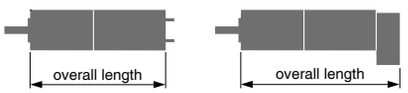
Ceramic Version



M 1:2

Technical Data				
Planetary Gearhead				straight teeth
Output shaft				stainless steel
Bearing at output				preloaded ball bearings
Radial play, 12 mm from flange				max. 0.06 mm
Axial play at axial load	< 5 N			0 mm
	> 5 N			max. 0.3 mm
Max. axial load (dynamic)				150 N
Max. force for press fits				300 N
Direction of rotation, drive to output				=
Max. continuous input speed				8000 rpm
Recommended temperature range				-40...+100°C
Number of stages	1	2	3	4
Max. radial load, 12 mm from flange	120 N	240 N	360 N	360 N

Stock program
Standard program
Special program (on request)



Part Numbers

203113	203115	**203119**	**203120**	203124	**203129**	203128	203133	203137	203141
203114	**203116**	260552*	203121	203125	260553*	203130	203134	203138	203142
260551*	203117		203122	203126		203131	203135	203139	260554*
	203118		203123	203127		203132	203136	203140	

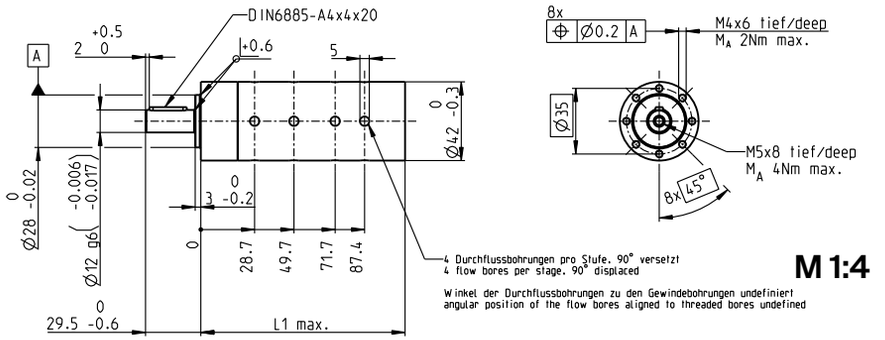
*no combination with EC 45 (150/250 W) and EC-i 40
**for EC 45 flat L1 is -3.6 mm

maxon Modular System

+ Motor	Page	+ Sensor	Page	Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts									
EC-4pole 30, 200 W	251	16 RIO	466	AB 20	516	153.9	168.4	168.4	182.9	182.9	182.9	197.4	197.4	197.4	197.4
EC-4pole 30, 200 W	251	AEDL/HEDL	469/475	AB 20	516	162.1	176.6	176.6	191.1	191.1	191.1	205.6	205.6	205.6	205.6
EC-i 40, 50 W	262/263					67.1	81.6	81.6	96.1	96.1	96.1	110.6	110.6	110.6	110.6
EC-i 40, 50 W	262/263	16 EASY/Abs.	449/453			78.8	93.3	93.3	107.8	107.8	107.8	122.3	122.3	122.3	122.3
EC-i 40, 50 W	262/263	16 RIO	466			81.6	96.1	96.1	110.6	110.6	110.6	125.1	125.1	125.1	125.1
EC-i 40, 50 W	262/263	AEDL/HEDL	469/475			90.1	104.6	104.6	119.1	119.1	119.1	133.6	133.6	133.6	133.6
EC-i 40, 70 W	264/265					77.1	91.6	91.6	106.1	106.1	106.1	120.6	120.6	120.6	120.6
EC-i 40, 70 W	264/265	16 EASY/Abs.	449/453			88.8	103.3	103.3	117.8	117.8	117.8	132.3	132.3	132.3	132.3
EC-i 40, 70 W	264/265	16 RIO	466			91.6	106.1	106.1	120.6	120.6	120.6	135.1	135.1	135.1	135.1
EC-i 40, 70 W	264/265	AEDL/HEDL	469/475			100.1	114.6	114.6	129.1	129.1	129.1	143.6	143.6	143.6	143.6
EC-i 40, 100 W	266					97.1	111.6	111.6	126.1	126.1	126.1	140.6	140.6	140.6	140.6
EC-i 40, 100 W	266	16 EASY/XT/Abs.	449/453			108.8	123.3	123.3	137.8	137.8	137.8	152.3	152.3	152.3	152.3
EC-i 40, 100 W	266	16 EASY Abs. XT	456			109.3	123.8	123.8	138.3	138.3	138.3	152.8	152.8	152.8	152.8
EC-i 40, 100 W	266	16 RIO	466			111.6	126.1	126.1	140.6	140.6	140.6	155.1	155.1	155.1	155.1
EC-i 40, 100 W	266	AEDL/HEDL	469/475			120.1	134.6	134.6	149.1	149.1	149.1	163.6	163.6	163.6	163.6
EC-i 40, 130 W	267					131.9	146.4	146.4	160.9	160.9	160.9	175.4	175.4	175.4	175.4
EC-i 40, 130 W	267	16 EASY/XT/Abs.	449/453			143.6	158.1	158.1	172.6	172.6	172.6	187.1	187.1	187.1	187.1
EC-i 40, 130 W	267	16 EASY Abs. XT	456			144.1	158.6	158.6	173.1	173.1	173.1	187.6	187.6	187.6	187.6
EC-i 40, 130 W	267	RIO	466			146.4	160.9	160.9	175.4	175.4	175.4	189.9	189.9	189.9	189.9
EC-i 40, 130 W	267	AEDL/HEDL	469/475			154.9	169.4	169.4	183.9	183.9	183.9	198.4	198.4	198.4	198.4
EC 45 flat, 30 W	285					53.9	68.4	68.4	82.9	82.9	82.9	97.4	97.4	97.4	97.4
EC 45 flat, 30 W	285	MILE	446			56.1	70.6	70.6	85.3	85.3	85.3	99.6	99.6	99.6	99.6
EC 45 flat, 50 W	286					59.5	74.0	74.0	88.5	88.5	88.5	103.0	103.0	103.0	103.0
EC 45 flat, 50 W	286	MILE	446			60.3	74.8	74.8	89.3	89.3	89.3	103.8	103.8	103.8	103.8
EC 45 flat, 60 W	287					59.5	74.0	74.0	88.5	88.5	88.5	103.0	103.0	103.0	103.0
EC 45 flat, 60 W	287	MILE	446			60.3	74.8	74.8	89.3	89.3	89.3	103.8	103.8	103.8	103.8
EC 45 flat, 90 W	288					65.5	80.0	80.0	94.5	94.5	94.5	109.0	109.0	109.0	109.0
EC 45 flat, 90 W	288	MILE	446			66.3	80.8	80.8	95.3	95.3	95.3	109.8	109.8	109.8	109.8
EC 45 flat, 70 W	289					64.5	79.0	79.0	93.5	93.5	93.5	108.0	108.0	108.0	108.0
EC 45 flat, 70 W	289	MILE	446			65.3	79.8	79.8	94.3	94.3	94.3	108.8	108.8	108.8	108.8
EC 45 flat, 80 W	290					64.5	79.0	79.0	93.5	93.5	93.5	108.0	108.0	108.0	108.0
EC 45 flat, 80 W	290	MILE	446			65.3	79.8	79.8	94.3	94.3	94.3	108.8	108.8	108.8	108.8
EC 45 flat, 120 W	291					70.5	85.0	85.0	99.5	99.5	99.5	114.0	114.0	114.0	114.0
EC 45 flat, 120 W	291	MILE	446			71.3	85.8	85.8	100.3	100.3	100.3	114.8	114.8	114.8	114.8
EC 45 flat, IE, IP 00	292					72.7	87.2	87.2	101.7	101.7	101.7	116.2	116.2	116.2	116.2
EC 45 flat, IE, IP 40	292					74.9	89.4	89.4	103.9	103.9	103.9	118.4	118.4	118.4	118.4
EC 45 flat, IE, IP 00	293					77.7	92.2	92.2	106.7	106.7	106.7	121.2	121.2	121.2	121.2
EC 45 flat, IE, IP 40	293					79.9	94.4	94.4	108.9	108.9	108.9	123.4	123.4	123.4	123.4

Planetary Gearhead GP 42 HD ∅42 mm, 10.0–50.0 Nm

Heavy Duty – for application in oil

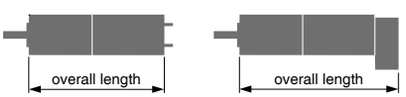


Technical Data	
Planetary Gearhead	straight teeth
Output shaft	stainless steel
Bearing at output	ball bearing
Radial play, 12 mm from flange	max. 0.05 mm
Axial play	max. 0.2 mm
Max. axial load (dynamic)	250 N
Max. force for press fits	450 N
Direction of rotation, drive to output	=
Max. continuous input speed	< 8000 rpm
Recommended temperature range	-55...+200°C
Extended range as option	-55...+260°C
Number of stages	1 2 3 4
Max. radial load, 12 mm from flange	250 N 480 N 720 N 720 N

Stock program
Standard program
Special program (on request)

			Part Numbers						
			454742	454744	454745	476936	454280	476945	476949
Gearhead Data (provisional)									
1	Reduction		3.5:1	12:1	43:1	81:1	150:1	285:1	441:1
2	Absolute reduction		7/2	49/4	343/8	2197/27	2401/16	15379/54	441/1
10	Mass inertia	gcm²	17.5	29	35.5	23.9	41.3	33.1	30.6
3	Max. motor shaft diameter	mm	10	10	10	8	10	8	10
	Part Numbers		476927	476928	476933	476937	476942	476946	476950
1	Reduction		4.3:1	15:1	53:1	91:1	186:1	319:1	488:1
2	Absolute reduction		13/3	91/6	637/12	91/1	4459/24	637/2	4394/9
10	Mass inertia	gcm²	11.1	23.3	31.8	25.4	37.6	34.2	26.3
3	Max. motor shaft diameter	mm	8	8	10	8	10	10	8
	Part Numbers			476929	476934	476938	476943	476947	476951
1	Reduction			19:1	66:1	113:1	230:1	353:1	546:1
2	Absolute reduction			169/9	1183/18	338/3	8281/36	28561/81	546/1
10	Mass inertia	gcm²		19.1	28.1	21.2	36.6	28.9	28.1
3	Max. motor shaft diameter	mm		8	8	8	10	8	8
	Part Numbers				454746		476944	476948	476952
1	Reduction				74:1		257:1	394:1	676:1
2	Absolute reduction				147/2		1029/4	1183/3	676/1
10	Mass inertia	gcm²			28.2		37.6	30.4	23.9
3	Max. motor shaft diameter	mm			10		10	8	8
4	Number of stages		1	2	3	3	4	4	4
5	Max. continuous torque	Nm	10	20	40	40	50	50	50
6	Max. intermittent torque at gear output	Nm	15	30	60	60	75	75	75
15	Max. overload torque[1]	Nm	20	40	80	80	100	100	100
7	Max. efficiency	%	95	87	78	78	65	65	65
8	Weight	g	430	600	710	710	780	780	780
9	Average backlash no load	°	0.6	0.8	0.8	1.0	1.0	1.0	1.0
11	Gearhead length L1	mm	57.7	79.9	102.2	102.2	116.9	116.9	116.9
13	Max. transmittable power (continuous)	W	2000	880	300	300	62	62	62
14	Max. transmittable power (intermittent)	W	3000	1320	450	450	93	93	93

1) Reduced expected life span



maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor/brake) + assembly parts						
EC-4pole 32 HD oil, A	253			221.3	243.5	265.8	265.8	280.5	280.5	280.5
EC-4pole 32 HD oil, B	253			201.3	223.5	245.8	245.8	260.5	260.5	260.5

Application

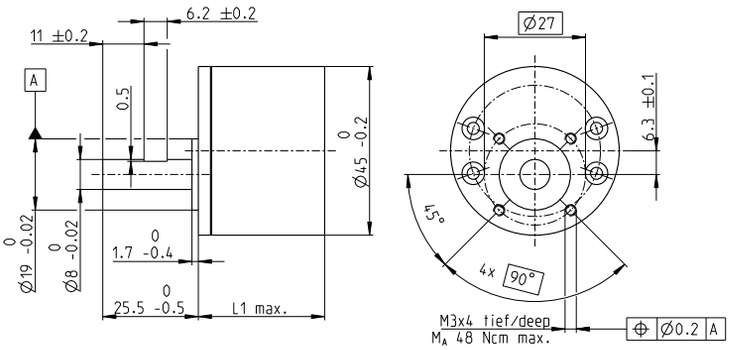
General
- extreme temperature applications
- vibration tested according to MIL-STD810F/ Jan2000 Fig. 514.5C-10
- operation in oil and high pressure

Oil & Gas Industry
- oil, gas and geothermal wells

Important Notice

This gearhead has been designed for applications in oil and is only equipped with minimum lubrication. Therefore it is not permitted to use it under normal air conditions.

Spur Gearhead GS 45 A ∅45 mm, 0.5–2.0 Nm



M 1:2

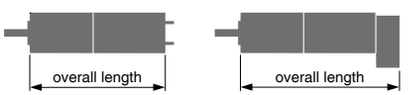
Technical Data	
Spur Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	ball bearing
Radial play, 10 mm from flange	max. 0.15 mm
Axial play	0.02–0.2 mm
Max. axial load (dynamic)	60 N
Max. force for press fits	60 N
Max. continuous input speed	6000 rpm
Recommended temperature range	-15...+80°C

Number of stages	2	3	4	5	6
Max. radial load, 10 mm from flange	120 N	180 N	190 N	190 N	190 N

Stock program
Standard program
Special program (on request)

	Gearhead Data		Part Numbers					
			678432	678440	678527	678531	678539	
1	Reduction		5:1	18:1	61:1	212:1	732:1	
2	Absolute reduction		51/10	459/26	20655/338	125862/595	492790/673	
10	Mass inertia	gcm²	3.7	1.6	1.0	0.8	0.8	
3	Max. motor shaft diameter	mm	3	3	3	3	3	
	Part Numbers		678433	678438	678528	678532	678540	
1	Reduction		7:1	26:1	89:1	310:1	1072:1	
2	Absolute reduction		209/28	9405/364	66632/745	183281/592	307572/287	
10	Mass inertia	gcm²	3.1	1.4	1.0	0.8	0.8	
3	Max. motor shaft diameter	mm	3	3	3	3	3	
	Part Numbers		678434	678436	678529	678533	678541	
1	Reduction		9:1	32:1	111:1	385:1	1334:1	
2	Absolute reduction		2295/247	8523/265	334/3	173808/451	198769/149	
10	Mass inertia	gcm²	2.1	1.4	0.6	0.5	0.4	
3	Max. motor shaft diameter	mm	3	3	3	3	3	
	Part Numbers		678435	678437	678530	678536	678542	
1	Reduction		14:1	47:1	163:1	564:1	1952:1	
2	Absolute reduction		2475/182	6221/132	141157/861	161880/287	1929023/988	
10	Mass inertia	gcm²	2.2	0.9	0.5	0.5	0.4	
3	Max. motor shaft diameter	mm	3	3	3	3	3	
4	Number of stages		2	3	4	5	6	
5	Max. continuous torque	Nm	0.5	2.0	2.0	2.0	2.0	
6	Max. intermittent torque at gear output	Nm	0.75	2.5	2.5	2.5	2.5	
12	Direction of rotation, drive to output		=	≠	=	≠	=	
7	Max. efficiency	%	87	76	66	59	53	
8	Weight	g	113	113	125	140	149	
9	Average backlash no load	°	1.6	2.0	2.4	2.8	3.2	
11	Gearhead length L1*	mm	24.2	24.2	26.9	30.4	33.8	

*for EC 45 flat, IE, L1 is max. + 4.0 mm

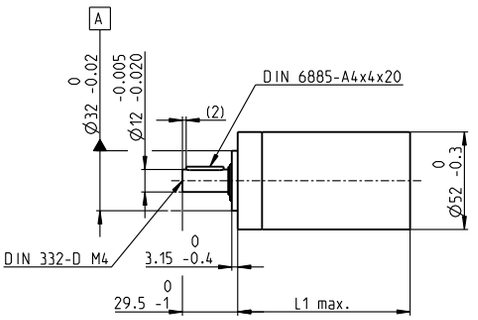


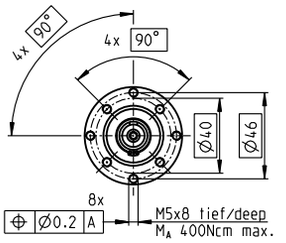
maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor/brake) + assembly parts				
EC 45 flat, 30 W	285			40.7	40.7	43.4	46.9	50.3
EC 45 flat, 30 W	285	MILE	446	42.9	42.9	45.6	49.1	52.5
EC 45 flat, 50 W	286			46.3	46.3	49.0	52.5	55.9
EC 45 flat, 50 W	286	MILE	446	47.1	47.1	49.8	53.3	56.7
EC 45 flat, 60 W	287			46.3	46.3	49.0	52.5	55.9
EC 45 flat, 60 W	287	MILE	446	47.1	47.1	49.8	53.3	56.7
EC 45 flat, 90 W	288			52.3	52.3	55.0	58.5	61.9
EC 45 flat, 90 W	288	MILE	446	53.1	53.1	55.8	59.3	62.7
EC 45 flat, 70 W	289			51.3	51.3	54.0	57.5	60.9
EC 45 flat, 70 W	289	MILE	446	52.1	52.1	54.8	58.3	61.7
EC 45 flat, 80 W	290			51.3	51.3	54.0	57.5	60.9
EC 45 flat, 80 W	290	MILE	446	52.1	52.1	54.8	58.3	61.7
EC 45 flat, 120 W	291			57.3	57.3	60.0	63.5	66.9
EC 45 flat, 120 W	291	MILE	446	58.1	58.1	60.8	64.3	67.7
EC 45 flat, IE, IP 00	292			59.9	59.9	62.6	66.1	69.5
EC 45 flat, IE, IP 40	292			62.1	62.1	64.8	68.3	71.7
EC 45 flat, IE, IP 00	293			64.9	64.9	67.6	71.1	74.5
EC 45 flat, IE, IP 40	293			67.1	67.1	69.8	73.3	76.7

Planetary Gearhead GP 52 C ∅52 mm, 4.0–30.0 Nm

Ceramic Version





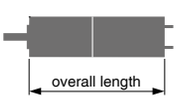
M 1:4

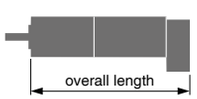
Technical Data					
Planetary Gearhead					straight teeth
Output shaft					stainless steel
Bearing at output					preloaded ball bearings
Radial play, 12 mm from flange					max. 0.06 mm
Axial play at axial load	< 5 N				0 mm
	> 5 N				max. 0.3 mm
Max. axial load (dynamic)					200 N
Max. force for press fits					500 N
Direction of rotation, drive to output					=
Max. continuous input speed					6000 rpm
Recommended temperature range					-15...+80°C
Extended range as option					-40...+100°C
Number of stages		1	2	3	4
Max. radial load, 12 mm from flange		420 N	630 N	900 N	900 N

gear

Stock program
Standard program
Special program (on request)

			Part Numbers						
			223080	223083	223089	223094	223097	223104	223109
Gearhead Data									
1	Reduction		3.5:1	12:1	43:1	91:1	150:1	319:1	546:1
2	Absolute reduction		7/2	49/4	343/8	91	2401/16	637/2	546
10	Mass inertia	gcm²	20.7	17.6	17.3	16.7	17.3	16.8	16.4
3	Max. motor shaft diameter	mm	10	10	10	10	10	10	10
	Part Numbers		223081	223084	223090	223095	223099	223105	223110
1	Reduction		4.3:1	15:1	53:1	113:1	186:1	353 :1	676:1
2	Absolute reduction		13/3	91/6	637/12	338/3	4459/24	2856/81	676
10	Mass inertia	gcm²	12	16.8	17.2	9.3	17.3	9.4	9.1
3	Max. motor shaft diameter	mm	8	10	10	8	10	8	8
	Part Numbers			223085	223091	223096	223101	223106	223111
1	Reduction			19:1	66:1	126:1	230:1	394:1	756:1
2	Absolute reduction			169/9	1183/18	126	8281/36	1183/3	756
10	Mass inertia	gcm²		9.5	16.7	16.4	16.8	16.7	16.4
3	Max. motor shaft diameter	mm		8	10	10	10	10	10
	Part Numbers			223086	223092	223098	223102	223107	223112
1	Reduction			21:1	74:1	156:1	257:1	441:1	936:1
2	Absolute reduction			21	147/2	156	1029/4	441	936
10	Mass inertia	gcm²		16.5	17.2	9.1	17.3	16.5	9.1
3	Max. motor shaft diameter	mm		10	10	8	10	10	8
	Part Numbers			223087	223093		223103	223108	
1	Reduction			26:1	81:1		285:1	488:1	
2	Absolute reduction			26	2197/27		15379/54	4394/9	
10	Mass inertia	gcm²		9.1	9.4		16.7	9.4	
3	Max. motor shaft diameter	mm		8	8		10	8	
4	Number of stages		1	2	3	3	4	4	4
5	Max. continuous torque	Nm	4	15	30	30	30	30	30
6	Max. intermittent torque at gear output	Nm	6	22.5	45	45	45	45	45
7	Max. efficiency	%	91	83	75	75	68	68	68
8	Weight	g	460	620	770	770	920	920	920
9	Average backlash no load	°	0.6	0.8	1.0	1.0	1.0	1.0	1.0
11	Gearhead length L1	mm	49.0	65.0	78.5	78.5	92.0	92.0	92.0



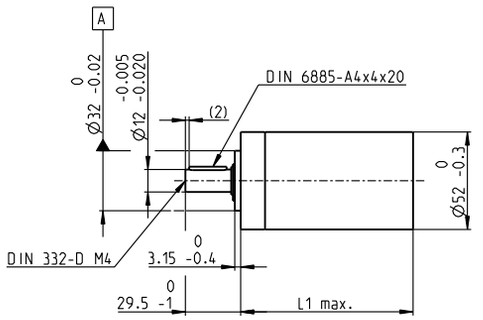


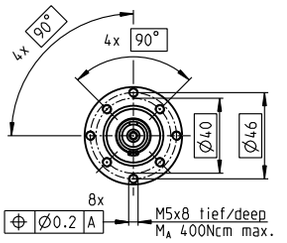
maxon Modular System

+ Motor	Page	+ Sensor	Page	Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts						
RE 40, 150 W	141					120.1	136.1	149.6	149.6	163.1	163.1	163.1
RE 40, 150 W	141	MR	464			131.5	147.5	161.0	161.0	174.5	174.5	174.5
RE 40, 150 W	141	HED_ 5540	471/474			140.8	156.8	170.3	170.3	183.8	183.8	183.8
RE 40, 150 W	141	HEDL 9140	478			174.1	190.1	203.6	203.6	217.1	217.1	217.1
RE 40, 150 W	141			AB 28	519	156.2	172.2	185.7	185.7	199.2	199.2	199.2
RE 40, 150 W	141			AB 28	520	164.2	180.2	193.7	193.7	207.2	207.2	207.2
RE 40, 150 W	141	HED_ 5540	471/474	AB 28	519	173.4	189.4	202.9	202.9	216.4	216.4	216.4
RE 40, 150 W	141	HEDL 9140	478	AB 28	520	184.6	200.6	214.1	214.1	227.6	227.6	227.6
RE 50, 200 W	142					157.1	173.1	186.6	186.6	200.1	200.1	200.1
RE 50, 200 W	142	HED_5540	472/474			177.8	193.8	207.3	207.3	220.8	220.8	220.8
RE 50, 200 W	142	HEDL 9140	479			219.5	235.5	249.0	249.0	262.5	262.5	262.5
RE 50, 200 W	142			AB 44	524	219.5	235.5	249.0	249.0	262.5	262.5	262.5
RE 50, 200 W	142	HEDL 9140	479	AB 44	524	232.5	248.5	262.0	262.0	275.5	275.5	275.5
EC 40, 170 W	229					129.1	145.1	158.6	158.6	172.1	172.1	172.1
EC 40, 170 W	229	HED_5540	472/474			152.5	168.5	182.0	182.0	195.5	195.5	195.5
EC 40, 170 W	229	Res 26	481			156.3	172.3	185.8	185.8	199.3	199.3	199.3
EC 40, 170 W	229			AB 32	521	171.8	187.8	201.3	201.3	214.8	214.8	214.8
EC 40, 170 W	229	HED_5540	472/474	AB 32	521	190.2	206.2	219.7	219.7	233.2	233.2	233.2
EC 45, 150 W	230					160.3	176.3	189.8	189.8	203.3	203.3	203.3
EC 45, 150 W	230	HEDL 9140	478			175.9	191.9	205.4	205.4	218.9	218.9	218.9
EC 45, 150 W	230	Res 26	481			160.3	176.3	189.8	189.8	203.3	203.3	203.3
EC 45, 150 W	230			AB 28	520	167.7	183.7	197.2	197.2	210.7	210.7	210.7
EC 45, 150 W	230	HEDL 9140	478	AB 28	520	184.7	200.7	214.2	214.2	227.7	227.7	227.7
EC 45, 250 W	231					193.1	209.1	222.6	222.6	236.1	236.1	236.1
EC 45, 250 W	231	HEDL 9140	478			208.7	224.7	238.2	238.2	251.7	251.7	251.7
EC 45, 250 W	231	Res 26	481			193.1	209.1	222.6	222.6	236.1	236.1	236.1

Planetary Gearhead GP 52 C ∅52 mm, 4.0–30.0 Nm

Ceramic Version



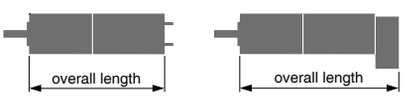


M 1:4

Technical Data					
Planetary Gearhead	straight teeth				
Output shaft	stainless steel				
Bearing at output	preloaded ball bearings				
Radial play, 12 mm from flange	max. 0.06 mm				
Axial play at axial load	< 5 N	0 mm			
	> 5 N	max. 0.3 mm			
Max. axial load (dynamic)	200 N				
Max. force for press fits	500 N				
Direction of rotation, drive to output	=				
Max. continuous input speed	6000 rpm				
Recommended temperature range	-15...+80°C				
Extended range as option	-40...+100°C				
Number of stages	1	2	3	4	
Max. radial load, 12 mm from flange	420 N	630 N	900 N	900 N	

Stock program
Standard program
Special program (on request)

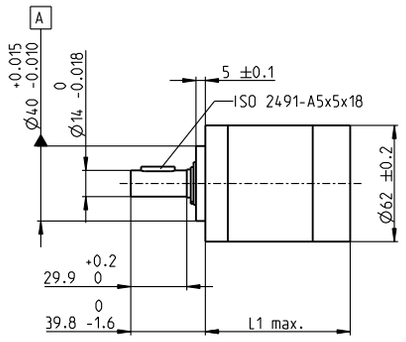
			Part Numbers						
			223080	223083	223089	223094	223097	223104	223109
Gearhead Data									
1	Reduction		3.5:1	12:1	43:1	91:1	150:1	319:1	546:1
2	Absolute reduction		7/2	49/4	343/8	91	2401/16	637/2	546
10	Mass inertia	gcm²	20.7	17.6	17.3	16.7	17.3	16.8	16.4
3	Max. motor shaft diameter	mm	10	10	10	10	10	10	10
	Part Numbers		223081	223084	223090	223095	223099	223105	223110
1	Reduction		4.3:1	15:1	53:1	113:1	186:1	353:1	676:1
2	Absolute reduction		13/3	91/6	637/12	338/3	4459/24	2856/81	676
10	Mass inertia	gcm²	12	16.8	17.2	9.3	17.3	9.4	9.1
3	Max. motor shaft diameter	mm	8	10	10	8	10	8	8
	Part Numbers			223085	223091	223096	223101	223106	223111
1	Reduction			19:1	66:1	126:1	230:1	394:1	756:1
2	Absolute reduction			169/9	1183/18	126	8281/36	1183/3	756
10	Mass inertia	gcm²		9.5	16.7	16.4	16.8	16.7	16.4
3	Max. motor shaft diameter	mm		8	10	10	10	10	10
	Part Numbers			223086	223092	223098	223102	223107	223112
1	Reduction			21:1	74:1	156:1	257:1	441:1	936:1
2	Absolute reduction			21	147/2	156	1029/4	441	936
10	Mass inertia	gcm²		16.5	17.2	9.1	17.3	16.5	9.1
3	Max. motor shaft diameter	mm		10	10	8	10	10	8
	Part Numbers			223087	223093		223103	223108	
1	Reduction			26:1	81:1		285:1	488:1	
2	Absolute reduction			26	2197/27		15379/54	4394/9	
10	Mass inertia	gcm²		9.1	9.4		16.7	9.4	
3	Max. motor shaft diameter	mm		8	8		10	8	
4	Number of stages		1	2	3	3	4	4	4
5	Max. continuous torque	Nm	4	15	30	30	30	30	30
6	Max. intermittent torque at gear output	Nm	6	22.5	45	45	45	45	45
7	Max. efficiency	%	91	83	75	75	68	68	68
8	Weight	g	460	620	770	770	920	920	920
9	Average backlash no load	°	0.6	0.8	1.0	1.0	1.0	1.0	1.0
11	Gearhead length L1	mm	49.0	65.0	78.5	78.5	92.0	92.0	92.0

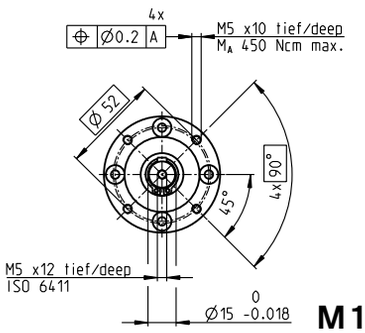


maxon Modular System

+ Motor	Page	+ Sensor	Page	Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts						
EC 45, 250 W	231			AB 28	520	200.5	216.5	230.0	230.0	243.5	243.5	243.5
EC 45, 250 W	231	HEDL 9140	478	AB 28	520	217.5	233.5	247.0	247.0	260.5	260.5	260.5
EC-max 40, 120 W	243					137.1	153.1	166.6	166.6	180.1	180.1	180.1
EC-max 40, 120 W	243	MR	464			153.0	169.0	182.5	182.5	196.0	196.0	196.0
EC-max 40, 120 W	243	HEDL 5540	475			160.5	176.5	190.0	190.0	203.5	203.5	203.5
EC-max 40, 120 W	243			AB 28	518	171.5	187.5	201.0	201.0	214.5	214.5	214.5
EC-max 40, 120 W	243	HEDL 5540	475	AB 28	518	189.8	205.8	219.3	219.3	232.8	232.8	232.8
EC-i 52, 180 W	268					129.1	145.1	158.6	158.6	172.1	172.1	172.1
EC-i 52, 180 W	268	16 EASY/Abs.	449/453			142.8	158.8	172.3	172.3	185.8	185.8	185.8
EC-i 52, 180 W	268	16 RIO	466			142.8	158.8	172.3	172.3	185.8	185.8	185.8
EC-i 52, 180 W	268	AEDL 5810	469/470			151.9	168.9	181.4	181.4	194.9	194.9	194.9
EC-i 52, 180 W	268	HEDL 5540	473-477			151.9	168.9	181.4	181.4	194.9	194.9	194.9
EC-i 52, 200 W	269					159.1	175.1	188.6	188.6	202.1	202.1	202.1
EC-i 52, 200 W	269	16 EASY/XT/Abs.	450-454			172.8	188.8	202.3	202.3	215.8	215.8	215.8
EC-i 52, 200 W	269	16 EASY Abs. XT	456			173.3	189.3	202.8	202.8	216.3	216.3	216.3
EC-i 52, 200 W	269	16 RIO	467			172.8	188.8	202.3	202.3	215.8	215.8	215.8
EC-i 52, 200 W	269	AEDL 5810	469/470			181.9	198.9	211.4	211.4	224.9	224.9	224.9
EC-i 52, 200 W	269	HEDL 5540	473-477			181.9	198.9	211.4	211.4	224.9	224.9	224.9
EC 60 flat, 100 W	294					89.8	105.8	119.3	119.3	132.8	132.8	132.8
EC 60 flat, 100 W	294	MILE	446			90.8	106.8	120.3	120.3	133.8	133.8	133.8
EC 60 flat, 150 W	295					89.8	105.8	119.3	119.3	132.8	132.8	132.8
EC 60 flat, 150 W	295	MILE	446			90.8	106.8	120.3	120.3	133.8	133.8	133.8
EC 60 flat, 200 W	296					97.6	113.6	127.1	127.1	140.6	140.6	140.6
EC 60 flat, 200 W	296	MILE	446			98.6	114.6	128.1	128.1	141.6	141.6	141.6

Planetary Gearhead GP 62 A ∅62 mm, 8.0–50.0 Nm



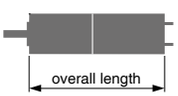


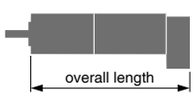
M 1:4

Technical Data			
Planetary Gearhead			straight teeth
Output shaft			steel
Bearing at output			ball bearing
Radial play, 7 mm from flange			max. 0.08 mm
Axial play			max. 1 mm
Max. axial load (dynamic)			120 N
Max. force for press fits			1000 N
Direction of rotation, drive to output			=
Max. continuous input speed			3000 rpm
Recommended temperature range			-30...+140°C
Number of stages	1	2	3
Max. radial load, 24 mm from flange	240 N	360 N	570 N

Stock program
Standard program
Special program (on request)

Part Numbers	110499	110501	110502	110503	110504	110505	110506	110507	110508
Gearhead Data									
1 Reduction	5.2:1	19:1	27:1	35:1	71:1	100:1	139:1	181:1	236:1
2 Absolute reduction	$^{57}/_{11}$	$^{3591}/_{187}$	$^{3249}/_{121}$	$^{1539}/_{44}$	$^{226223}/_{3179}$	$^{204687}/_{2057}$	$^{185193}/_{1331}$	$^{87723}/_{484}$	$^{41553}/_{176}$
3 Max. motor shaft diameter mm	8	8	8	8	8	8	8	8	8
4 Number of stages	1	2	2	2	3	3	3	3	3
5 Max. continuous torque Nm	8	25	25	25	50	50	50	50	50
6 Max. intermittent torque at gear output Nm	12	37	37	37	75	75	75	75	75
7 Max. efficiency %	80	75	75	75	70	70	70	70	70
8 Weight g	950	1250	1250	1250	1540	1540	1540	1540	1540
9 Average backlash no load °	1.0	1.5	1.5	1.5	2.0	2.0	2.0	2.0	2.0
10 Mass inertia gcm^2	109	100	105	89	104	105	102	88	89
11 Gearhead length L1 mm	72.5	88.3	88.3	88.3	104.2	104.2	104.2	104.2	104.2

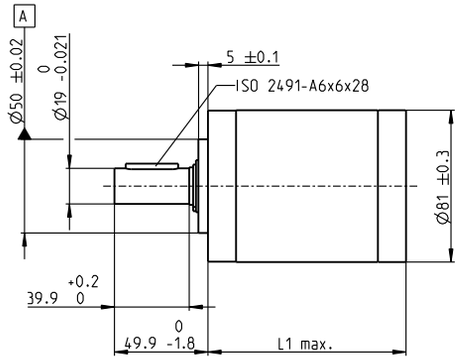


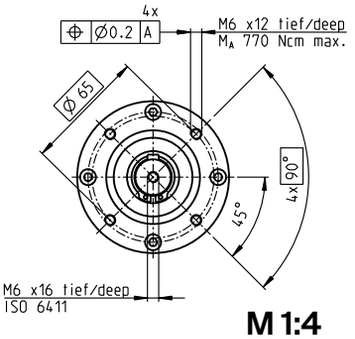


maxon Modular System

+ Motor	Page	+ Sensor	Page	Brake	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor/brake) + assembly parts							
RE 50, 200 W	142				180.6	196.4	196.4	196.4	212.3	212.3	212.3	212.3	212.3
RE 50, 200 W	142	HEDS 5540	472		201.3	217.1	217.1	217.1	233.0	233.0	233.0	233.0	233.0
RE 50, 200 W	142	HEDL 5540	474		201.3	217.1	217.1	217.1	233.0	233.0	233.0	233.0	233.0
RE 50, 200 W	142	HEDL 9140	479		243.0	258.8	258.8	258.8	274.7	274.7	274.7	274.7	278.7
RE 50, 200 W	142			AB 44	524	243.0	258.8	258.8	258.8	274.7	274.7	274.7	278.7
RE 50, 200 W	142	HEDL 9140	479	AB 44	524	256.0	271.8	271.8	271.8	287.7	287.7	287.7	287.7
EC 45, 250 W	231					216.6	232.4	232.4	232.4	248.3	248.3	248.3	248.3	248.3
EC 45, 250 W	231	HEDL 9140	478			232.2	248.0	248.0	248.0	263.9	263.9	263.9	263.9	263.9
EC 45, 250 W	231	Res 26	481			216.6	232.4	232.4	232.4	248.3	248.3	248.3	248.3	248.3
EC 45, 250 W	231			AB 28	520	224.0	239.8	239.8	239.8	255.7	255.7	255.7	255.7	255.7
EC 45, 250 W	231	HEDL 9140	478	AB 28	520	241.0	256.8	256.8	256.8	272.7	272.7	272.7	272.7	272.7

Planetary Gearhead GP 81 A ∅81 mm, 20.0–120.0 Nm



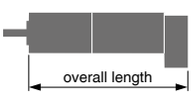


M 1:4

Technical Data			
Planetary Gearhead			straight teeth
Output shaft			steel
Bearing at output			ball bearing
Radial play, 8 mm from flange			max. 0.1 mm
Axial play			max. 1 mm
Max. force for press fits			1500 N
Direction of rotation, drive to output			=
Max. continuous input speed			3000 rpm
Recommended temperature range			-30...+140°C
Number of stages	1	2	3
Max. radial load, 24 mm from flange	400 N	600 N	1000 N
Max. axial load (dynamic)	80 N	120 N	200 N

Stock program
Standard program
Special program (on request)

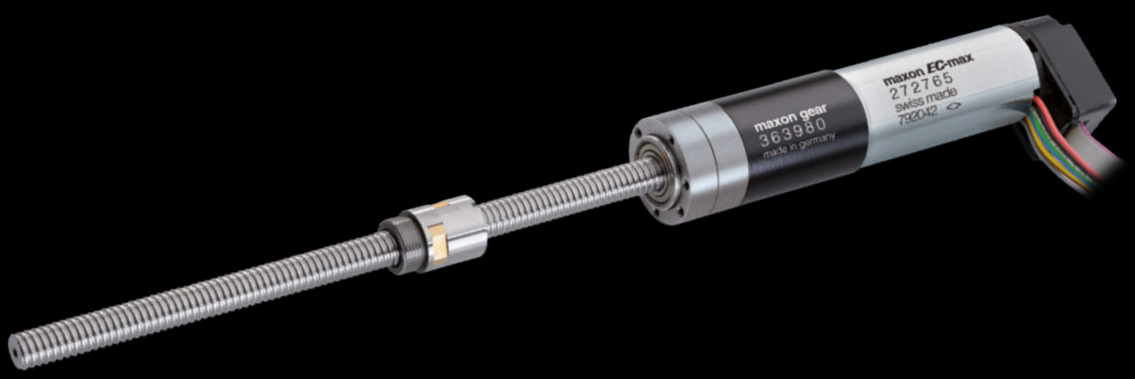
Part Numbers	110408	110409	110410	110411	110412	110413
Gearhead Data						
1 Reduction	3.7:1	14:1	25:1	51:1	93:1	308:1
2 Absolute reduction	$^{63}/_{17}$	$^{3969}/_{289}$	$^{1701}/_{68}$	$^{250047}/_{4913}$	$^{107163}/_{1156}$	$^{19683}/_{64}$
3 Max. motor shaft diameter mm	14	14	14	14	14	14
4 Number of stages	1	2	2	3	3	3
5 Max. continuous torque Nm	20	60	60	120	120	120
6 Max. intermittent torque at gear output Nm	30	90	90	180	180	180
7 Max. efficiency %	80	75	75	70	70	70
8 Weight g	2300	3000	3000	3700	3700	3700
9 Average backlash no load °	0.5	0.55	0.55	0.6	0.6	0.6
10 Mass inertia gcm²	165	155	125	88	154	89
11 Gearhead length L1 mm	92.0	113.7	113.7	135.3	135.3	135.3



maxon Modular System

+ Motor	Page	+ Sensor	Page	Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts					
RE 65, 250 W	143					223.5	245.2	245.2	266.8	266.8	266.8
RE 65, 250 W	143	HEDS 5540	472			249.4	271.1	271.1	292.7	292.7	292.7
RE 65, 250 W	143	HEDL 5540	474			249.4	271.1	271.1	292.7	292.7	292.7
RE 65, 250 W	143	HEDL 9140	479			279.6	301.3	301.3	322.9	322.9	322.9
RE 65, 250 W	143			AB 44	524	279.6	301.3	301.3	322.9	322.9	322.9
RE 65, 250 W	143	HEDL 9140	479	AB 44	524	297.6	319.3	319.3	340.9	340.9	340.9
EC 60, 400 W	232					269.4	291.1	291.1	312.7	312.7	312.7
EC 60, 400 W	232	HEDL 9140	478			269.4	291.1	291.1	312.7	312.7	312.7
EC 60, 400 W	232	Res 26	481			269.4	291.1	291.1	312.7	312.7	312.7
EC 60, 400 W	232			AB 41	523	283.0	304.7	304.7	326.3	326.3	326.3
EC 60, 400 W	232	HEDL 9140	478	AB 41	523	307.0	328.7	328.7	350.3	350.3	350.3

maxon screw drive

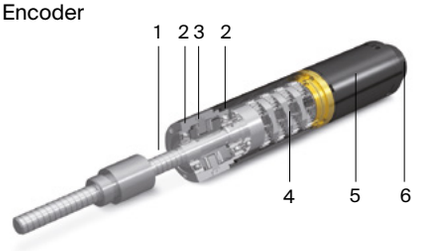


Compact, easy to configure linear actuators as part of a complete system with integrated thrust bearing for high axial loads. Versions available with metric lead screw, trapezoidal lead screw or ball screw.

Screw Drive Basics

Design

1 Screw, directly implemented in the gearhead
2 Radial bearing
3 Axial bearing
4 Planetary gearhead 0–4 stages
5 Motor
6 Encoder

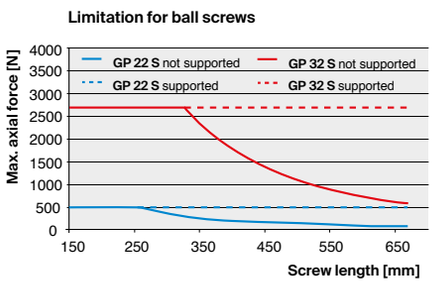


The particular type of screw required must first be established before a screw drive can be designed. Every type of screw has different characteristics and a number of specific limits. These limits are taken into account in the technical data.

Ball screw:
– highly efficient
– not self-locking
– high load capacity
Metric lead screw:
– self-locking
– low costs
Trapezoidal lead screw:
– same as metric lead screw
– higher load capacity than metric lead screw

Feed force

For the calculation of the feed force acceleration and friction forces as well as gravity have to be taken into consideration. Exceeding the maximum permissible load must be avoided, as this damages the screw. The maximum permissible feed force is displayed for standard screws. For longer screws, the permissible feed force can be limited by the critical compressive force of the screw. In this case, supporting the end of the screw may be necessary.



Torque

The required torque of the screw M_a [mNm] is calculated with the feed force F_L [N] (load), the thread lead p [mm] and the efficiency of the screw η_1.

$$M_a = \frac{F_L \cdot p}{2 \cdot \pi \cdot \eta_1}$$

In combination with the gearhead, the required motor torque M_{mot} [mNm] is:

$$M_{mot} = \frac{F_a \cdot p}{2 \cdot \pi \cdot i \cdot \eta}$$

Where i is the gearhead reduction ratio and η the efficiency of the complete screw drive.

Technical Data

The “Technical Data” block contains generally applicable data on screw, nut and gearhead. These are independent of the gearhead reduction ratio.

Length

The data sheets show the screw drives with the standard lengths. Other lengths are available as an option in 5 mm steps up to a given maximum length. Please give detailed requirements for special lengths.

Max. efficiency/mass inertia

The values stated refer to the screw alone (without gearhead). The values with gearhead are given in the “Gearhead data” main data field.

Nut

Standard screw drives are supplied with a thread nut. Flange or cylinder nuts are also available as an option. See details with corresponding reference number on page 422.

Bearing

The output stage and the screw are supported by preloaded axial bearings. This means that the high axial forces can be absorbed directly by the gearhead without additional support.

Speed and feed velocity

Feed velocity v_L [mm/s] is linked to output speed n [rpm] by the lead p [mm].

$$v_L = \frac{p \cdot n}{60}$$

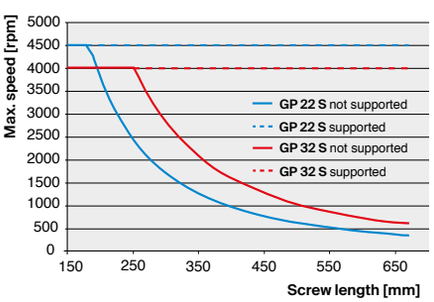
In combination with the gearhead, the motor speed n_{mot} [rpm] is:

$$n_{mot} = \frac{v_L \cdot 60 \cdot i}{p}$$

Where i is the gearhead reduction ratio and p the screw lead.

The screw speed is limited by the resonance frequency of the screw and for ball screws additionally by the ball return system.

In addition, the maximum permissible speed of the gearhead has to be considered.



Explanation

7 Max. efficiency
The given efficiency is a maximum value that applies when loaded with maximum feed force. Efficiency falls sharply with very small loads. The stated value refers to the complete screw drive (gearhead and screw).

20 Max. feed velocity
Specifies the maximum permissible feed velocity.

21 Max. feed force (continuous)
Is the maximum permissible feed force which may be continuously applied. Exceeding this value results in a reduced service life.

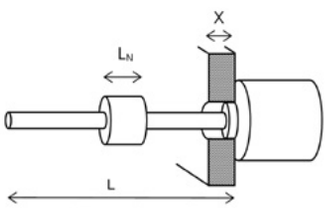
22 Max. feed force (intermittent)
Is the maximum permissible feed force which may be intermittently applied. “Intermittently” is defined as follows:
– during max. 1 second
– during max. 10% of operation
Exceeding these values results in a reduced service life.

23 Mechanical positioning accuracy
In this value, following factors are taken into consideration:
– backlash of the gearhead
– accuracy of the screw
– axial play of the nut

Maximum stroke

The maximum possible stroke depends on the length of the screw L [mm]. The length of the nut L_N [mm] and the thickness of its mounting plate X [mm] must be taken into consideration.

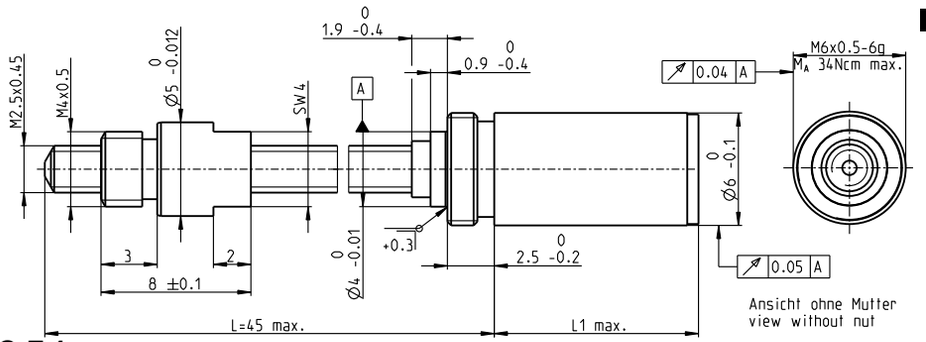
Stroke = L − (L_N + X + stroke reserve + opt. SPIN02)



Mounting and safety instructions

Using a ball screw with a flange nut, the mounting through a hole is only possible with the optional rectangular mounting flange.
The ball screw nut may never be removed. As the balls are preloaded remounting would be impossible.
The screw may never block during operation, as this could damage the screw nut or gearhead.
Service life crucially depends on the precision with which the gear is fixed to the screw nut. Eccentricities and angle errors sometimes result in massive radial loading which must never exceed the given maximum value.
Additional information can be found in the maxon online shop at the item under downloads.

Screw Drive GP 6 S ∅6 mm, Metric Lead Screw



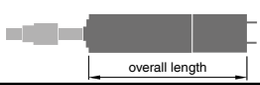
M 2.5:1

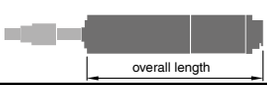
Technical Data						
Screw	M2.5 x 0.45, stainless steel					
Standard length	45 mm					
Special length (5 mm steps)	max. 80 mm					
Nut (standard)	thread nut					
Material	bronze					
Axial play	< 0.088 mm					
Planetary gearhead	straight teeth					
Bearing	ball bearing					
Radial play, 5 mm from flange	< 0.12 mm					
Axial play	preloaded					
Max. continuous input speed	12000 rpm					
Recommended temperature range	-15...+80°C					
Max. axial load (static)[1]	10 N					
Number of stages	1	2	3	4	5	
Max. radial load, 5 mm from flange	5 N	5 N	5 N	5 N	5 N	

Stock program
Standard program
Special program (on request)

Part Numbers	428758	428757	428756	420663	428755
Screw Drive Data					
1 Reduction	3.9 : 1	15 : 1	57 : 1	221 : 1	854 : 1
2 Absolute reduction	$^{27}/_{7}$	$^{729}/_{49}$	$^{19683}/_{343}$	$^{531441}/_{2401}$	$^{1438907}/_{16807}$
20 Max. feed velocity[1] mm/s	15	10	2.6	0.7	0.2
21 Max. feed force (continuous)[1] N	2	3	4	6	10
22 Max. feed force (intermittent)[1] N	6	8	12	15	15
4 Number of stages	1	2	3	4	5
7 Max. efficiency gearhead incl. screw %	28	24	21	19	16
8 Weight[1] g	2.9	3.3	3.7	4.1	4.5
9 Average backlash no load °	1.8	2.0	2.2	2.5	2.8
23 Mechanical positioning accuracy[1] mm	0.106	0.107	0.107	0.107	0.108
10 Mass inertia gearhead incl. screw[1] gcm²	0.001	0.001	0.001	0.001	0.001
11 Gearhead length L1 mm	6.9	9.4	12.0	14.5	17.1

[1] based on screw length 45 mm



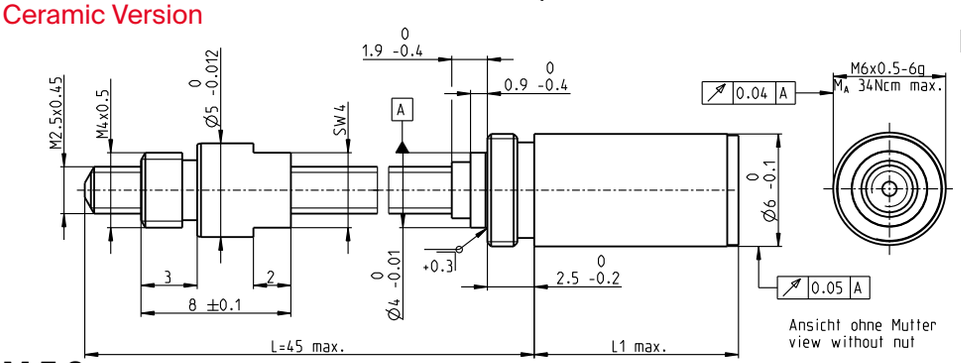


maxon Modular System

+ Motor	Page	+ Sensor / Brake	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor / brake) + assembly parts				
RE 6, 0.3 W, A	107			22.6	25.1	27.7	30.2	32.8
RE 6, 0.3 W, B	107			26.6	29.1	31.7	34.2	36.8

Screw Drive GP 6 S ∅6 mm, Metric Lead Screw

Ceramic Version



M 5:2

Technical Data						
Screw						M2.5 x 0.45, ceramic
Standard length						45 mm
Special length (5 mm steps)						max. 80 mm
Nut (standard)						thread nut
Material						stainless steel
Axial play						< 0.079 mm
Planetary gearhead						straight teeth
Bearing						ball bearing
Radial play, 5 mm from flange						< 0.12 mm
Axial play						preloaded
Max. continuous input speed						12 000 rpm
Recommended temperature range						-15...+80°C
Max. axial load (static)[1]						10 N
Number of stages	1	2	3	4	5	
Max. radial load, 5 mm from flange	5 N	5 N	5 N	5 N	5 N	

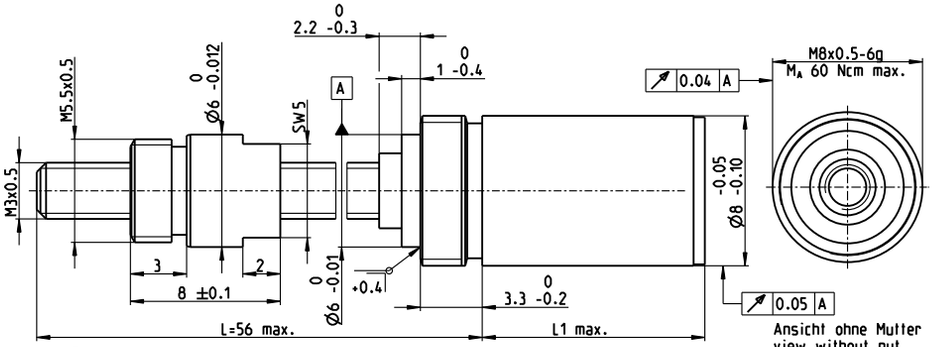
Stock program
Standard program
Special program (on request)

Part Numbers	437380	437379	437378	437377	437375
Screw Drive Data					
1 Reduction	3.9 : 1	15 : 1	57 : 1	221 : 1	854 : 1
2 Absolute reduction	$^{27}/_{7}$	$^{729}/_{49}$	$^{19683}/_{343}$	$^{531441}/_{2401}$	$^{1438907}/_{16807}$
20 Max. feed velocity[1] mm/s	25	10	2.6	0.7	0.2
21 Max. feed force (continuous)[1] N	2	3	5	7	11
22 Max. feed force (intermittent)[1] N	6	10	15	15	15
4 Number of stages	1	2	3	4	5
7 Max. efficiency gearhead incl. screw %	39	34	30	27	23
8 Weight[1] g	2.9	3.3	3.7	4.1	4.5
9 Average backlash no load °	1.8	2.0	2.2	2.5	2.8
23 Mechanical positioning accuracy[1] mm	0.081	0.082	0.082	0.082	0.083
10 Mass inertia gearhead incl. screw[1] gcm^2	0.001	0.001	0.001	0.001	0.001
11 Gearhead length L1 mm	6.9	9.4	12.0	14.5	17.1

[1] based on screw length 45 mm

maxon Modular System										
+ Motor	Page	**+ Sensor/Brake**	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor / brake) + assembly parts						
RE 6, 0.3 W, A	107			22.6	25.1	27.7	30.2	32.8		
RE 6, 0.3 W, B	107			26.6	29.1	31.7	34.2	36.8		

Screw Drive GP 8 S ∅8 mm, Metric Lead Screw



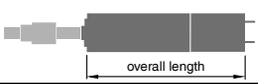
M 5:2

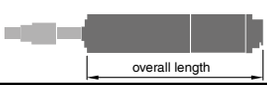
Technical Data						
Screw						M3 x 0.5, stainless steel
Standard length						56 mm
Special length (5 mm steps)						max. 100 mm
Nut (standard)						thread nut
Material						bronze
Axial play						< 0.1 mm
Planetary gearhead						straight teeth
Bearing						ball bearing
Radial play, 5 mm from flange						< 0.08 mm
Axial play						preloaded
Max. continuous input speed						12000 rpm
Recommended temperature range						-15...+80°C
Max. axial load (static)[1]						25 N
Number of stages	1	2	3	4	5	
Max. radial load, 5 mm from flange	5 N	5 N	5 N	5 N	5 N	

Stock program
Standard program
Special program (on request)

Part Numbers					
	473643	473644	473645	473646	473647
Screw Drive Data					
1 Reduction	4:1	16:1	64:1	256:1	1024:1
2 Absolute reduction	4/1	16/1	64/1	256/1	1024/1
20 Max. feed velocity[1] mm/s	15	6.3	1.6	0.4	0.1
21 Max. feed force (continuous)[1] N	3	6	9	14	22
22 Max. feed force (intermittent)[1] N	8	18	27	27	27
4 Number of stages	1	2	3	4	5
7 Max. efficiency gearhead incl. screw %	27	24	22	19	17
8 Weight[1] g	6.3	6.9	7.5	8.1	8.7
9 Average backlash no load °	1.8	2.0	2.2	2.5	2.8
23 Mechanical positioning accuracy[1] mm	0.112	0.112	0.112	0.112	0.113
10 Mass inertia gearhead incl. screw[1] gcm²	0.005	0.004	0.004	0.004	0.004
11 Gearhead length L1 mm	7.0	9.6	12.2	14.8	17.4

[1] based on screw length 56 mm

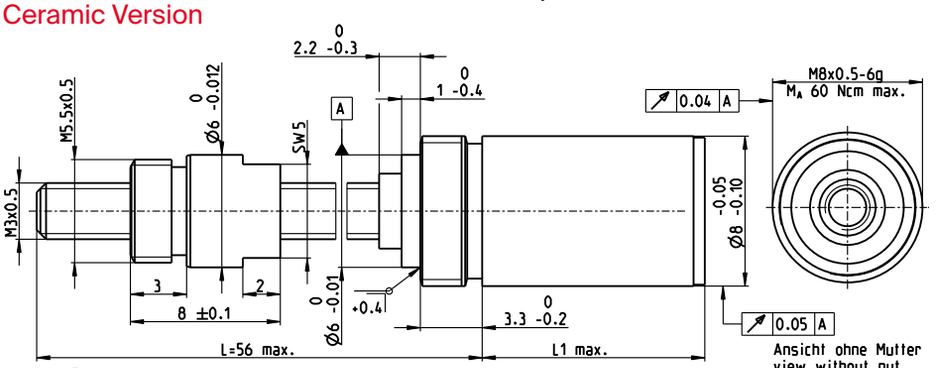




maxon Modular System										
+ Motor	Page	**+ Sensor/Brake**	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor / brake) + assembly parts						
RE 8, 0.5 W, A	108			23.7	26.3	28.9	31.5	34.1		
RE 8, 0.5 W, B	108			26.7	29.3	31.9	34.5	37.1		
RE 8, 0.5 W, A	108	MR	458	30.3	32.9	35.5	38.1	40.7		
RE 8, 0.5 W, A	108	Enc 8 OPT	465	31.9	34.5	37.1	39.7	42.3		

Screw Drive GP 8 S ∅8 mm, Metric Lead Screw

Ceramic Version



M 5:2

Technical Data						
Screw						M3 x 0.5, ceramic
Standard length						56 mm
Special length (5 mm steps)						max. 100 mm
Nut (standard)						thread nut
Material						stainless steel
Axial play						< 0.09 mm
Planetary gearhead						straight teeth
Bearing						ball bearing
Radial play, 5 mm from flange						< 0.08 mm
Axial play						preloaded
Max. continuous input speed						12 000 rpm
Recommended temperature range						-15...+80°C
Max. axial load (static)[1]						25 N
Number of stages	1	2	3	4	5	
Max. radial load, 5 mm from flange	5 N	5 N	5 N	5 N	5 N	

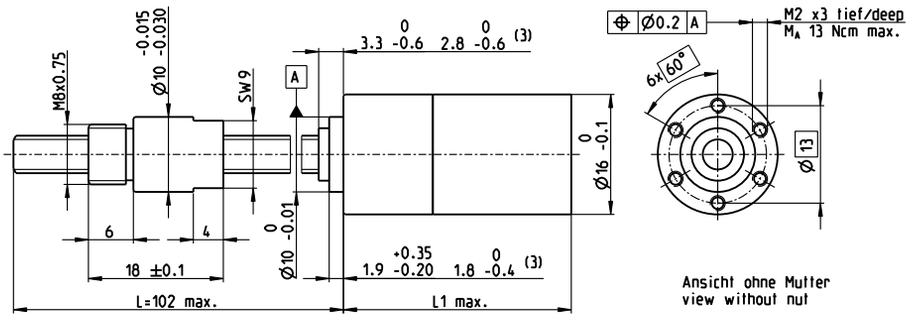
Stock program
Standard program
Special program (on request)

Screw Drive Data (provisional)		Part Numbers							
		473636	473637	473639	473640	473641			
1	Reduction	4:1	16:1	64:1	256:1	1024:1			
2	Absolute reduction	4/1	16/1	64/1	256/1	1024/1			
20	Max. feed velocity[1]	mm/s	25	6.3	1.6	0.4	0.1			
21	Max. feed force (continuous)[1]	N	3	7	11	17	27			
22	Max. feed force (intermittent)[1]	N	14	22	32	32	32			
4	Number of stages		1	2	3	4	5			
7	Max. efficiency gearhead incl. screw	%	38	34	31	28	25			
8	Weight[1]	g	6.3	6.9	7.5	8.1	8.7			
9	Average backlash no load	°	1.8	2.0	2.2	2.5	2.8			
23	Mechanical positioning accuracy[1]	mm	0.087	0.087	0.087	0.087	0.088			
10	Mass inertia gearhead incl. screw[1]	gcm²	0.005	0.004	0.004	0.004	0.004			
11	Gearhead length L1	mm	7.0	9.6	12.2	14.8	17.4			

[1] based on screw length 56 mm

maxon Modular System				Overall length [mm] = Motor length + gearhead length + (sensor / brake) + assembly parts							
+ Motor	Page	+ Sensor/Brake	Page								
RE 8, 0.5 W, A	108			23.7	26.3	28.9	31.5	34.1			
RE 8, 0.5 W, B	108			26.7	29.3	31.9	34.5	37.1			
RE 8, 0.5 W, A	108	MR	458	30.3	32.9	35.5	38.1	40.7			
RE 8, 0.5 W, A	108	Enc 8 OPT	465	31.9	34.5	37.1	39.7	42.3			

Screw Drive GP 16 S ∅16 mm, Ball Screw



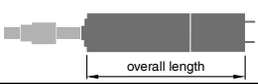
M 1:1

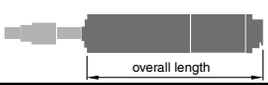
Technical Data						
Screw	∅5 x 2, stainless steel					
Standard length	102 mm					
Special length (5 mm steps)	max. 200 mm					
Nut (standard)	thread nut					
Material	X46Cr13, hardened					
Axial play	< 0.01 mm					
Planetary gearhead	straight teeth					
Bearing	ball bearing/axial bearing					
Radial play, 6 mm from flange	< 0.08 mm					
Axial play	preloaded					
Max. continuous input speed[2]	12000 rpm					
Recommended temperature range	-15...+80°C					
Max. axial load (static)[1]	500 N					
Number of stages	0	1	2	3	4	
Max. radial load, 6 mm from flange	20 N	40 N	60 N	80 N	80 N	

Stock program
Standard program
Special program (on request)

			Part Numbers							
			424221	424222	424223	424219	424224			
Screw Drive Data (provisional)										
1	Reduction		1:1	4.4:1	19:1	84:1	370:1			
2	Absolute reduction		1/1	57/13	3249/169	185193/2197	1055600 1/28561			
20	Max. feed velocity[1]	mm/s	150	90.9	21.1	4.8	1.1			
21	Max. feed force (continuous)[1]	N	54	64	104	171	280			
22	Max. feed force (intermittent)[1]	N	149	176	287	403	403			
	Part Numbers			424731	424733	424745	424749			
1	Reduction			5.4:1	24:1	104:1	455:1			
2	Absolute reduction			27/5	1539/65	87723/845	5000211/10985			
20	Max. feed velocity[1]	mm/s		74.1	16.7	3.8	0.9			
21	Max. feed force (continuous)[1]	N		69	113	184	300			
22	Max. feed force (intermittent)[1]	N		189	311	403	403			
	Part Numbers				424744	424747	424750			
1	Reduction				29:1	128 :1	561:1			
2	Absolute reduction				729/25	41553/325	236852 1/4225			
20	Max. feed velocity[1]	mm/s			13.8	3.1	0.7			
21	Max. feed force (continuous)[1]	N			120	197	322			
22	Max. feed force (intermittent)[1]	N			331	403	403			
	Part Numbers					424748	424751			
1	Reduction					157:1	690:1			
2	Absolute reduction					19683/125	1121931/1625			
20	Max. feed velocity[1]	mm/s				2.5	0.6			
21	Max. feed force (continuous)[1]	N				211	345			
22	Max. feed force (intermittent)[1]	N				403	403			
	Part Numbers						424752			
1	Reduction						850:1			
2	Absolute reduction						53144 1/625			
20	Max. feed velocity[1]	mm/s					0.5			
21	Max. feed force (continuous)[1]	N					370			
22	Max. feed force (intermittent)[1]	N					403			
4	Number of stages		0	1	2	3	4			
7	Max. efficiency gearhead incl. screw	%	93	87	79	71	63			
8	Weight[1]	g	52	58	61	65	69			
9	Average backlash no load	°	1.0	1.4	1.6	2.0	2.4			
23	Mechanical positioning accuracy[1]	mm	0.039	0.041	0.042	0.044	0.046			
10	Mass inertia gearhead incl. screw[1]	gcm²	0.23	0.11	0.05	0.05	0.05			
11	Gearhead length L1	mm	19.2	22.3	27.4	31.0	34.6			

[1] based on screw length 102 mm (standard length) [2] for reduction 1:1 = 4500 rpm [3] for reduction 1:1

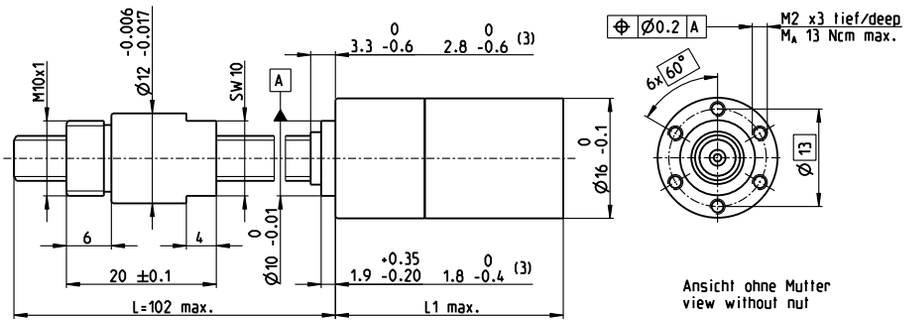




maxon Modular System

+ Motor	Page	+ Sensor / Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor / brake) + assembly parts				
RE 16, 2 W	129			41.6	44.7	49.8	53.4	57.0
RE 16, 2 W	129	MR	460/461	47.3	50.4	55.5	59.1	62.7
RE 16, 3.2 W	130/131			59.7	62.8	67.9	71.5	75.1
RE 16, 3.2 W	131	MR	460/461	64.7	67.8	72.9	76.5	80.1
RE 16, 4.5 W	132/133			62.7	65.8	70.9	74.5	78.1
RE 16, 4.5 W	133	MR	460/461	67.7	70.8	75.9	79.5	83.1
A-max 16	149–152			–	47.8	52.9	56.5	60.1
A-max 16	150/152	MR	460/461	–	52.8	57.9	61.5	65.1
EC-max 16, 5 W	235			–	46.4	51.5	55.1	58.7
EC-max 16, 5 W	235	MR	462	–	53.7	58.8	62.4	66.0
EC-max 16, 8 W	237			–	58.4	63.5	67.1	70.7
EC-max 16, 8 W	237	MR	462	–	65.7	70.8	74.4	78.0

Screw Drive GP 16 S ∅16 mm, Metric Lead Screw



M 1:1

Technical Data						
Screw						M6 x 1, stainless steel
Standard length						102 mm
Special length (5 mm steps)						max. 200 mm
Nut (standard)						thread nut
Material						bronze
Axial play						< 0.134 mm
Planetary gearhead						straight teeth
Bearing						ball bearing/axial bearing
Radial play, 6 mm from flange						< 0.08 mm
Axial play						preloaded
Max. continuous input speed [2]						12 000 rpm
Recommended temperature range						-15...+80°C
Max. axial load (static)[1]						500 N
Number of stages	0	1	2	3	4	
Max. radial load, 6 mm from flange	20 N	40 N	60 N	80 N	80 N	

Stock program
Standard program
Special program (on request)

			Part Numbers							
			424231	424232	424233	424234	424235			
Screw Drive Data (provisional)										
1	Reduction		1:1	4.4:1	19:1	84:1	370:1			
2	Absolute reduction		1/1	57/13	3249/169	185193/2197	10556001/28561			
20	Max. feed velocity[1]	mm/s	50.0	45.5	10.5	2.4	0.5			
21	Max. feed force (continuous)[1]	N	35	37	60	98	160			
22	Max. feed force (intermittent)[1]	N	134	138	224	315	315			
	Part Numbers			424797	424798	424800	424806			
1	Reduction			5.4:1	24:1	104:1	455:1			
2	Absolute reduction			27/5	1539/65	87723/845	5000211/10985			
20	Max. feed velocity[1]	mm/s		37.0	8.3	1.9	0.4			
21	Max. feed force (continuous)[1]	N		39	64	105	172			
22	Max. feed force (intermittent)[1]	N		148	243	315	315			
	Part Numbers				424799	424803	424807			
1	Reduction				29:1	128:1	561:1			
2	Absolute reduction				729/25	41553/325	2368521/4225			
20	Max. feed velocity[1]	mm/s			6.9	1.6	0.4			
21	Max. feed force (continuous)[1]	N			69	112	184			
22	Max. feed force (intermittent)[1]	N			258	315	315			
	Part Numbers					424804	424808			
1	Reduction					157:1	690:1			
2	Absolute reduction					19683/125	1121931/1625			
20	Max. feed velocity[1]	mm/s				1.3	0.3			
21	Max. feed force (continuous)[1]	N				120	197			
22	Max. feed force (intermittent)[1]	N				315	315			
	Part Numbers						424809			
1	Reduction						850:1			
2	Absolute reduction						53144/625			
20	Max. feed velocity[1]	mm/s					0.2			
21	Max. feed force (continuous)[1]	N					211			
22	Max. feed force (intermittent)[1]	N					315			
4	Number of stages		0	1	2	3	4			
7	Max. efficiency gearhead incl. screw	%	28	27	24	22	19			
8	Weight[1]	g	55	61	64	68	72			
9	Average backlash no load	°	1.0	1.4	1.6	2.0	2.4			
23	Mechanical positioning accuracy[1]	mm	0.166	0.167	0.167	0.169	0.170			
10	Mass inertia gearhead incl. screw[1]	gcm²	0.23	0.11	0.05	0.05	0.05			
11	Gearhead length L1	mm	19.2	22.3	27.4	31.0	34.6			

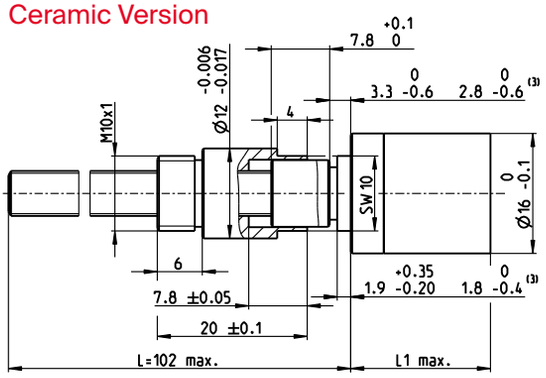
[1] based on screw length 102 mm (standard length) [2] for reduction 1:1 = 3000 rpm [3] for reduction 1:1

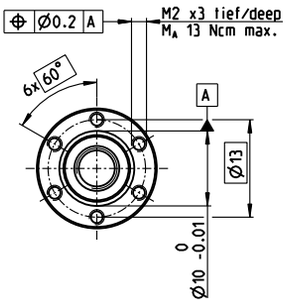
maxon Modular System

+ Motor	Page	+ Sensor / Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts				
RE 16, 2 W	129			41.6	44.7	49.8	53.4	57.0
RE 16, 2 W	129	MR	460/461	47.3	50.4	55.5	59.1	62.7
RE 16, 3.2 W	130/131			59.7	62.8	67.9	71.5	75.1
RE 16, 3.2 W	131	MR	460/461	64.7	67.8	72.9	76.5	80.1
RE 16, 4.5 W	132/133			62.7	65.8	70.9	74.5	78.1
RE 16, 4.5 W	133	MR	460/461	67.7	70.8	75.9	79.5	83.1
A-max 16	149–152			–	47.8	52.9	56.5	60.1
A-max 16	150/152	MR	460/461	–	52.8	57.9	61.5	65.1
EC-max 16, 5 W	235			–	46.4	51.5	55.1	58.7
EC-max 16, 5 W	235	MR	462	–	53.7	58.8	62.4	66.0
EC-max 16, 8 W	237			–	58.4	63.5	67.1	70.7
EC-max 16, 8 W	237	MR	462	–	65.7	70.8	74.4	78.0

Screw Drive GP 16 S ∅16 mm, Metric Lead Screw

Ceramic Version





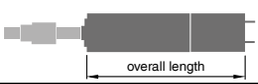
M 1:1

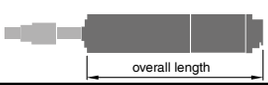
Technical Data						
Screw						M6 x 1, ceramic
Standard length						102 mm
Special length (5 mm steps)						max. 200 mm
Nut (standard)						thread nut
Material						X8CrNiS18-9
Axial play						< 0.134 mm
Planetary gearhead						straight teeth
Bearing						ball bearing
Radial play, 6 mm from flange						< 0.08 mm
Axial play						preloaded
Max. continuous input speed [2]						12000 rpm
Recommended temperature range						-15...+80°C
Max. axial load (static)[1]						500 N
Number of stages	0	1	2	3	4	
Max. radial load, 6 mm from flange	20 N	40 N	60 N	80 N	80 N	

Stock program
Standard program
Special program (on request)

			Part Numbers				
			424241	424242	424243	424244	424245
Screw Drive Data (provisional)							
1	Reduction		1:1	4.4:1	19:1	84:1	370:1
2	Absolute reduction		1/1	57/13	3249/169	185193/2197	1055600 1/28561
20	Max. feed velocity[1]	mm/s	50.0	45.5	10.5	2.4	0.5
21	Max. feed force (continuous)[1]	N	44	46	74	122	200
22	Max. feed force (intermittent)[1]	N	134	138	224	315	315
	Part Numbers			424811	424812	424814	424819
1	Reduction			5.4:1	24:1	104:1	455:1
2	Absolute reduction			27/5	1539/65	87723/845	5000211/10985
20	Max. feed velocity[1]	mm/s		37.0	8.3	1.9	0.4
21	Max. feed force (continuous)[1]	N		49	80	131	215
22	Max. feed force (intermittent)[1]	N		148	243	315	315
	Part Numbers				424813	424815	424820
1	Reduction				29:1	128:1	561:1
2	Absolute reduction				729/25	41553/325	236852 1/4225
20	Max. feed velocity[1]	mm/s			6.9	1.6	0.4
21	Max. feed force (continuous)[1]	N			86	141	230
22	Max. feed force (intermittent)[1]	N			258	315	315
	Part Numbers					424818	424821
1	Reduction					157:1	690:1
2	Absolute reduction					19683/125	1121931/1625
20	Max. feed velocity[1]	mm/s				1.3	0.3
21	Max. feed force (continuous)[1]	N				150	246
22	Max. feed force (intermittent)[1]	N				315	315
	Part Numbers						424822
1	Reduction						850:1
2	Absolute reduction						531441/625
20	Max. feed velocity[1]	mm/s					0.2
21	Max. feed force (continuous)[1]	N					264
22	Max. feed force (intermittent)[1]	N					315
4	Number of stages		0	1	2	3	4
7	Max. efficiency gearhead incl. screw	%	41	38	34	31	28
8	Weight[1]	g	55	61	64	68	72
9	Average backlash no load	°	1.0	1.4	1.6	2.0	2.4
23	Mechanical positioning accuracy[1]	mm	0.166	0.167	0.167	0.169	0.170
10	Mass inertia gearhead incl. screw[1]	gcm²	0.23	0.11	0.05	0.05	0.05
11	Gearhead length L1	mm	19.2	22.3	27.4	31.0	34.6

[1] based on screw length 102 mm (standard length) [2] for reduction 1:1 = 3000 rpm [3] for reduction 1:1

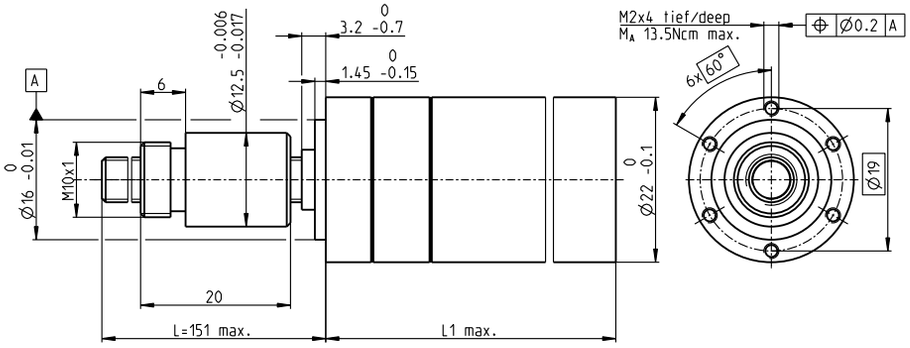




maxon Modular System

+ Motor	Page	+ Sensor / Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts				
RE 16, 2 W	129			41.6	44.7	49.8	53.4	57.0
RE 16, 2 W	129	MR	460/461	47.3	50.4	55.5	59.1	62.7
RE 16, 3.2 W	130/131			59.7	62.8	67.9	71.5	75.1
RE 16, 3.2 W	131	MR	460/461	64.7	67.8	72.9	76.5	80.1
RE 16, 4.5 W	132/133			62.7	65.8	70.9	74.5	78.1
RE 16, 4.5 W	133	MR	460/461	67.7	70.8	75.9	79.5	83.1
A-max 16	149–152			–	47.8	52.9	56.5	60.1
A-max 16	150/152	MR	460/461	–	52.8	57.9	61.5	65.1
EC-max 16, 5 W	235			–	46.4	51.5	55.1	58.7
EC-max 16, 5 W	235	MR	462	–	53.7	58.8	62.4	66.0
EC-max 16, 8 W	237			–	58.4	63.5	67.1	70.7
EC-max 16, 8 W	237	MR	462	–	65.7	70.8	74.4	78.0

Screw Drive GP 22 S ∅22 mm, Ball Screw



M 1:1

Technical Data

Screw	∅6 x 2, stainless steel
Standard length	151 mm
Special length (5 mm steps)	max. 300 mm
Nut (standard)	thread nut
Material	100CR6, hardened
Axial play	< 0.01 mm
Planetary gearhead	straight teeth
Bearing	ball bearing/thrust roller bearing
Radial play, 5 mm from flange	< 0.05 mm
Axial play	preloaded
Max. continuous input speed [2]	8000 rpm
Recommended temperature range	-15...+80°C
Max. axial load (static)[1]	500 N

Number of stages	0	1	2	3	4
Max. radial load, 15 mm from flange	80 N	80 N	130 N	180 N	180 N

Stock program
Standard program
Special program (on request)

			Part Numbers								
			363863	363864	363867	363871	363872	363877	363882	363887	363892
Screw Drive Data											
1	Reduction		1:1	3.8:1	14:1	29:1	53:1	89:1	198:1	333:1	479:1
2	Absolute reduction		1/1	15/4	225/16	729/25	3375/64	4617/52	50625/256	69255/208	124659/260
20	Max. feed velocity[1]	mm/s	150	70	19	9.2	5.0	3.0	1.3	0.8	0.6
21	Max. feed force (continuous)[1]	N	77	100	154	196	240	285	372	443	500
22	Max. feed force (intermittent)[1]	N	183	236	365	465	500	500	500	500	500
	Part Numbers			363865	364041		363873	363878	363883	363888	363893
1	Reduction			4.4:1	16:1		62:1	104:1	231:1	370:1	561:1
2	Absolute reduction			57/13	885/52		12825/208	87723/845	192375/832	10556001/28561	2368521/4225
20	Max. feed velocity[1]	mm/s		61	17		4.3	2.6	1.2	0.7	0.5
21	Max. feed force (continuous)[1]	N		105	161		253	300	392	458	500
22	Max. feed force (intermittent)[1]	N		248	381		500	500	500	500	500
	Part Numbers			363866	363868		363874	363879	363884	363889	363894
1	Reduction			5.4:1	19:1		72:1	109:1	270:1	389:1	590:1
2	Absolute reduction			27/5	3249/169		48735/676	2187/20	731025/2704	263169/676	59049/100
20	Max. feed velocity[1]	mm/s		49	14		3.7	2.4	1.0	0.7	0.5
21	Max. feed force (continuous)[1]	N		112	170		266	305	413	466	500
22	Max. feed force (intermittent)[1]	N		266	404		500	500	500	500	500
	Part Numbers				363869		363875	363880	363885	363890	363895
1	Reduction				20:1		76:1	128:1	285:1	410:1	690:1
2	Absolute reduction				81/4		1215/16	41553/325	18225/64	6561/16	1121931/1625
20	Max. feed velocity[1]	mm/s			13		3.5	2.1	0.9	0.7	0.4
21	Max. feed force (continuous)[1]	N			173		270	322	420	474	500
22	Max. feed force (intermittent)[1]	N			411		500	500	500	500	500
	Part Numbers				363870		363876	363881	363886	363891	363896
1	Reduction				24:1		84:1	157:1	316:1	455:1	850:1
2	Absolute reduction				1539/65		185193/2197	19683/125	2777895/8788	5000211/10985	531441/625
20	Max. feed velocity[1]	mm/s			11		3.2	1.7	0.8	0.6	0.3
21	Max. feed force (continuous)[1]	N			184		280	345	435	491	500
22	Max. feed force (intermittent)[1]	N			437		500	500	500	500	500
4	Number of stages		0	1	2	2	3	3	4	4	4
7	Max. efficiency gearhead incl. screw	%	96	81	67	67	57	57	47	47	47
8	Weight[1]	g	103	103	115	115	128	128	141	141	141
9	Average backlash no load	°	1.0	1.0	1.2	1.2	1.6	1.6	2.0	2.0	2.0
23	Mechanical positioning accuracy[1]	mm	0.039	0.039	0.040	0.040	0.042	0.042	0.044	0.044	0.044
10	Mass inertia gearhead incl. screw[1]	gcm²	10	1.0	0.4	0.4	0.3	0.3	0.3	0.3	0.3
11	Gearhead length L1	mm	38.0	38.0	44.8	44.8	51.6	51.6	58.4	58.4	58.4

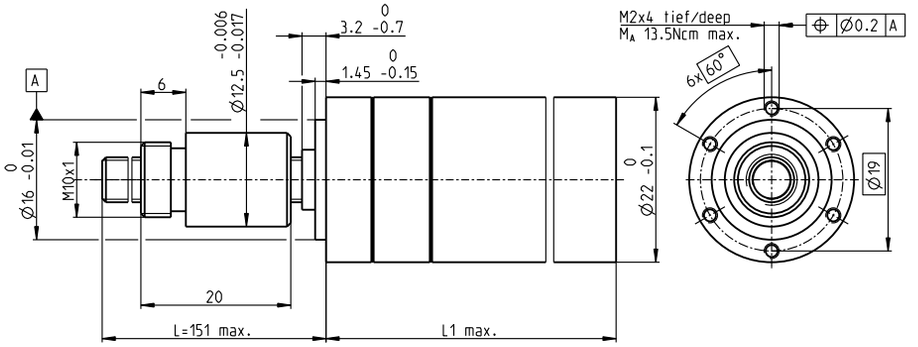
[1] based on screw length 151 mm (standard length) [2] for reduction 1:1 = 4500 rpm

maxon Modular System

Overall length [mm] = Motor length + gearhead length + (sensor / brake) + assembly parts

+ Motor	Page	+ Sensor/Brake	Page								
A-max 19	153–156			–	64.2	71.0	71.0	77.8	77.8	84.6	84.6	84.6
A-max 19, 1.5 W	154	MR	460/461	–	69.3	76.1	76.1	82.9	82.9	89.7	89.7	89.7
A-max 19, 1.5 W	154	Enc 22	468	–	78.6	85.4	85.4	92.2	92.2	99.0	99.0	99.0
A-max 19, 2.5 W	155/156			–	66.8	73.6	73.6	80.4	80.4	87.2	87.2	87.2
A-max 19, 2.5 W	156	MR	460/461	–	71.1	77.9	77.9	84.7	84.7	91.5	91.5	91.5
A-max 19, 2.5 W	156	Enc 22	468	–	81.2	88.0	88.0	94.8	94.8	101.6	101.6	101.6
A-max 22	157–160			–	67.2	74.0	74.0	80.8	80.8	87.6	87.6	87.6
A-max 22	158/160	MR	460/461	–	72.2	79.0	79.0	85.8	85.8	92.6	92.6	92.6
A-max 22	158/160	Enc 22	468	–	81.6	88.4	88.4	95.2	95.2	102.0	102.0	102.0
EC-max 16, 8 W	237			–	71.4	78.2	78.2	85.0	85.0	91.8	91.8	91.8
EC-max 16, 8 W	237	MR	447	–	78.7	85.5	85.5	92.3	92.3	99.1	99.1	99.1
EC-max 22, 12 W	238			–	70.1	76.9	76.9	83.7	83.7	90.5	90.5	90.5
EC-max 22, 12 W	238	MR	447	–	79.8	86.6	86.6	93.4	93.4	100.2	100.2	100.2
EC-max 22, 12 W	238	AB 20	516	–	105.7	112.5	112.5	119.3	119.3	126.1	126.1	126.1

Screw Drive GP 22 S ∅22 mm, Metric Lead Screw



M 1:1

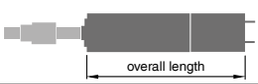
Technical Data

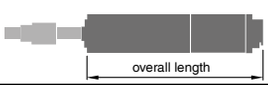
Screw	M6 x 1, stainless steel				
Standard length	151 mm				
Special length (5 mm steps)	max. 300 mm				
Nut (standard)	thread nut				
Material	bronze				
Axial play	< 0.008 mm				
Planetary gearhead	straight teeth				
Bearing	ball bearing/thrust roller bearing				
Radial play, 5 mm from flange	< 0.05 mm				
Axial play	preloaded				
Max. continuous input speed[2]	8000 rpm				
Recommended temperature range	-15...+80°C				
Max. axial load (static)[1]	550 N				
Number of stages	0	1	2	3	4
Max. radial load, 15 mm from flange	80 N	80 N	130 N	180 N	180 N

Stock program
Standard program
Special program (on request)

			Part Numbers								
			363826	363827	363830	363834	363835	363840	363845	363850	363855
Screw Drive Data											
1	Reduction		1:1	3.8:1	14:1	29:1	53:1	89:1	198:1	333:1	479:1
2	Absolute reduction		1/1	15/4	225/16	729/25	3375/64	4617/52	50625/256	69255/208	124659/260
20	Max. feed velocity[1]	mm/s	101	35	9.5	4.6	2.5	1.5	0.7	0.4	0.3
21	Max. feed force (continuous)[1]	N	42	60	92	118	144	171	223	266	300
22	Max. feed force (intermittent)[1]	N	118	167	259	330	350	350	350	350	350
	Part Numbers			363828	364040		363836	363841	363846	363851	363856
1	Reduction			4.4:1	16:1		62:1	104:1	231:1	370:1	561:1
2	Absolute reduction			57/13	885/52		12825/208	87723/845	192375/832	10556001/28561	2368521/4225
20	Max. feed velocity[1]	mm/s		30	8.3		2.2	1.3	0.6	0.4	0.2
21	Max. feed force (continuous)[1]	N		63	97		152	180	235	275	316
22	Max. feed force (intermittent)[1]	N		176	270		350	350	350	350	350
	Part Numbers			363829	363831		363837	363842	363847	363852	363857
1	Reduction			5.4:1	19:1		72:1	109:1	270:1	389:1	590:1
2	Absolute reduction			27/5	3249/169		48735/676	2187/20	731025/2704	263169/676	59049/100
20	Max. feed velocity[1]	mm/s		25	7.0		1.9	1.2	0.5	0.3	0.2
21	Max. feed force (continuous)[1]	N		67	102		159	183	248	280	321
22	Max. feed force (intermittent)[1]	N		188	286		350	350	350	350	350
	Part Numbers				363832		363838	363843	363848	363853	363858
1	Reduction				20:1		76:1	128:1	285:1	410:1	690:1
2	Absolute reduction				81/4		1215/16	41553/325	18225/64	6561/16	1121931/1625
20	Max. feed velocity[1]	mm/s			6.7		1.8	1.0	0.5	0.3	0.2
21	Max. feed force (continuous)[1]	N			104		162	193	252	285	339
22	Max. feed force (intermittent)[1]	N			291		350	350	350	350	350
	Part Numbers				363833		363839	363844	363849	363854	363859
1	Reduction				24:1		84:1	157:1	316:1	455:1	850:1
2	Absolute reduction				1539/65		185193/2197	19683/125	2777895/8788	5000211/10985	53144/625
20	Max. feed velocity[1]	mm/s			5.6		1.6	0.8	0.4	0.3	0.2
21	Max. feed force (continuous)[1]	N			111		168	207	261	295	350
22	Max. feed force (intermittent)[1]	N			310		350	350	350	350	350
4	Number of stages		0	1	2	2	3	3	4	4	4
7	Max. efficiency gearhead incl. screw	%	42	35	29	29	25	25	20	20	20
8	Weight[1]	g	103	103	116	116	128	128	141	141	141
9	Average backlash no load	°	1.0	1.0	1.2	1.2	1.6	1.6	2.0	2.0	2.0
23	Mechanical positioning accuracy[1]	mm	0.034	0.034	0.034	0.034	0.034	0.034	0.037	0.037	0.037
10	Mass inertia gearhead incl. screw[1]	gcm²	10	1.0	0.4	0.4	0.3	0.3	0.3	0.3	0.3
11	Gearhead length L1	mm	38.0	38.0	44.8	44.8	51.6	51.6	58.4	58.4	58.4

[1] based on screw length 151 mm (standard length) [2] for reduction 1:1 = 6088 rpm

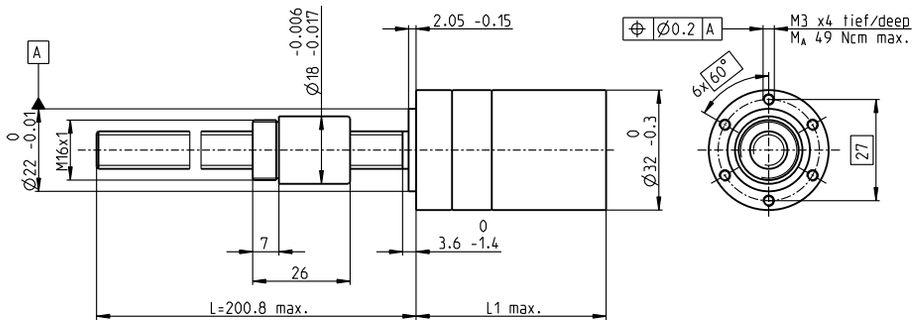




maxon Modular System

+ Motor	Page	+ Sensor / Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts							
A-max 19	153–156			–	64.2	71.0	71.0	77.8	77.8	84.6	84.6	84.6
A-max 19, 1.5 W	154	MR	460/461	–	69.3	76.1	76.1	82.9	82.9	89.7	89.7	89.7
A-max 19, 1.5 W	154	Enc 22	468	–	78.6	85.4	85.4	92.2	92.2	99.0	99.0	99.0
A-max 19, 2.5 W	155/156			–	66.8	73.6	73.6	80.4	80.4	87.2	87.2	87.2
A-max 19, 2.5 W	156	MR	460/461	–	71.1	77.9	77.9	84.7	84.7	91.5	91.5	91.5
A-max 19, 2.5 W	156	Enc 22	468	–	81.2	88.0	88.0	94.8	94.8	101.6	101.6	101.6
A-max 22	157–160			–	67.2	74.0	74.0	80.8	80.8	87.6	87.6	87.6
A-max 22	158/160	MR	460/461	–	72.2	79.0	79.0	85.8	85.8	92.6	92.6	92.6
A-max 22	158/160	Enc 22	468	–	81.6	88.4	88.4	95.2	95.2	102.0	102.0	102.0
EC-max 16, 8 W	237			–	71.4	78.2	78.2	85.0	85.0	91.8	91.8	91.8
EC-max 16, 8 W	237	MR	447	–	78.7	85.5	85.5	92.3	92.3	99.1	99.1	99.1
EC-max 22, 12 W	238			–	70.1	76.9	76.9	83.7	83.7	90.5	90.5	90.5
EC-max 22, 12 W	238	MR	447	–	79.8	86.6	86.6	93.4	93.4	100.2	100.2	100.2
EC-max 22, 12 W	238	AB 20	516	–	105.7	112.5	112.5	119.3	119.3	126.1	126.1	126.1

Screw Drive GP 32 S ∅32 mm, Ball Screw



M 1:2

Technical Data	
Screw	∅10 x 2, stainless steel
Standard length	200.8 mm
Special length (5 mm steps)	max. 600 mm
Nut (standard)	thread nut
Material	100CR6, hardened
Axial play	< 0.01 mm
Planetary gearhead	straight teeth
Bearing	ball bearing/thrust roller bearing
Radial play, 5 mm from flange	< 0.05 mm
Axial play	preloaded
Max. continuous input speed [2]	8000 rpm
Recommended temperature range	-15...+80°C
Max. axial load (static)[1]	2700 N

Number of stages	0	1	2	3	4
Max. radial load, 15 mm from flange	200 N	200 N	350 N	400 N	400 N

Stock program
Standard program
Special program (on request)

Part Numbers	363970	363971	363974	363979	363980	363985	363990	363995	364000
Screw Drive Data									
1 Reduction	1:1	3.7:1	14:1	33:1	51:1	111:1	246:1	492:1	762:1
2 Absolute reduction	1/1	26/7	676/49	529/16	17576/343	13824/125	421824/1715	86112/175	19044/25
20 Max. feed velocity[1] mm/s	133	72	19	8.1	5.2	2.4	1.1	0.5	0.3
21 Max. feed force (continuous)[1] N	386	474	739	983	1137	1473	1921	2420	2700
22 Max. feed force (intermittent)[1] N	1023	1255	1956	2604	2700	2700	2700	2700	2700
Part Numbers		363972	363975		363981	363986	363991	363996	364001
1 Reduction		4.8:1	18:1		66:1	123:1	295:1	531:1	913:1
2 Absolute reduction		24/5	624/35		16224/245	6877/56	101062/343	331776/625	36501/40
20 Max. feed velocity[1] mm/s		56	15		4.0	2.2	0.9	0.5	0.3
21 Max. feed force (continuous)[1] N		517	803		1239	1524	2041	2482	2700
22 Max. feed force (intermittent)[1] N		1369	2127		2700	2700	2700	2700	2700
Part Numbers		363973	363976		363982	363987	363992	363997	364002
1 Reduction		5.8:1	21:1		79:1	132:1	318:1	589:1	1093:1
2 Absolute reduction		23/4	299/14		3887/49	3312/25	389376/1225	20631/35	279841/256
20 Max. feed velocity[1] mm/s		46	13		3.4	2.0	0.8	0.5	0.2
21 Max. feed force (continuous)[1] N		551	846		1315	1561	2092	2569	2700
22 Max. feed force (intermittent)[1] N		1458	2239		2700	2700	2700	2700	2700
Part Numbers			363977		363983	363988	363993	363998	
1 Reduction			23:1		86:1	159:1	411:1	636:1	
2 Absolute reduction			576/25		14976/175	1587/10	359424/875	79488/125	
20 Max. feed velocity[1] mm/s			12		3.1	1.7	0.6	0.4	
21 Max. feed force (continuous)[1] N			872		1353	1661	2279	2636	
22 Max. feed force (intermittent)[1] N			2308		2700	2700	2700	2700	
Part Numbers			363978		363984	363989	363994	363999	
1 Reduction			28:1		103:1	190:1	456:1	706:1	
2 Absolute reduction			138/5		3588/35	12167/64	89401/196	158171/224	
20 Max. feed velocity[1] mm/s			9.5		2.6	1.4	0.6	0.4	
21 Max. feed force (continuous)[1] N			931		1437	1762	2359	2700	
22 Max. feed force (intermittent)[1] N			2465		2700	2700	2700	2700	
4 Number of stages	0	1	2	2	3	3	4	4	4
7 Max. efficiency gearhead incl. screw %	94	75	71	71	66	66	56	56	56
8 Weight[1] g	304	304	331	331	359	359	387	387	387
9 Average backlash no load °	0.7	0.7	0.8	0.8	1.0	1.0	1.0	1.0	1.0
23 Mechanical positioning accuracy[1] mm	0.037	0.037	0.037	0.037	0.039	0.039	0.039	0.039	0.039
10 Mass inertia gearhead incl. screw[1] gcm²	42.3	4.2	0.9	0.9	0.7	0.7	0.7	0.7	0.7
11 Gearhead length L1 mm	51.0	51.0	57.7	57.7	64.4	64.4	71.1	71.1	71.1

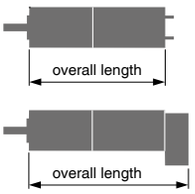
[1] based on screw length 200.8 mm (standard length) [2] for reduction 1:1 = 4000 rpm

maxon Modular System

+ Motor	Page	+ Sensor / Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts								
RE 25	134/136			105.6	105.6	112.3	112.3	119.0	119.0	125.7	125.7	125.7
RE 25	134/136	MR	463	116.6	116.6	123.3	123.3	130.0	130.0	136.7	136.7	136.7
RE 25	134/136	Enc 22	468	119.7	119.7	126.4	126.4	133.1	133.1	139.8	139.8	139.8
RE 25	134/136	HED_5540	471/473	126.4	126.4	133.1	133.1	139.8	139.8	146.5	146.5	146.5
RE 25	134/136	DCT 22	480	127.9	127.9	134.6	134.6	141.3	141.3	148.0	148.0	148.0
RE 25, 20 W	135			94.1	94.1	100.8	100.8	107.5	107.5	114.2	114.2	114.2
RE 25, 20 W	135	MR	463	105.1	105.1	111.8	111.8	118.5	118.5	125.2	125.2	125.2
RE 25, 20 W	135	HED_5540	471/473	114.9	114.9	121.6	121.6	128.3	128.3	135.0	135.0	135.0
RE 25, 20 W	135	DCT 22	480	116.4	116.4	123.1	123.1	129.8	129.8	136.5	136.5	136.5
RE 25, 20 W	135	AB 28	519	128.2	128.2	134.9	134.9	141.6	141.6	148.3	148.3	148.3
RE 25, 20 W	135	HED_5540/AB 28	471/519	145.4	145.4	152.1	152.1	158.8	158.8	165.5	165.5	165.5
RE 25, 20 W	136	AB 28	519	139.7	139.7	146.4	146.4	153.1	153.1	159.8	159.8	159.8
RE 25, 20 W	136	HED_5540/AB 28	471/519	156.9	156.9	163.6	163.6	170.3	170.3	177.0	177.0	177.0
RE 30, 60 W	138			119.1	119.1	125.8	125.8	132.5	132.5	139.2	139.2	139.2
RE 30, 60 W	138	MR	464	130.5	130.5	137.2	137.2	143.9	143.9	150.6	150.6	150.6
RE 30, 60 W	138	HED_5540	471/473	139.9	139.9	146.6	146.6	153.3	153.3	160.0	160.0	160.0

Continuation of the modular system on pages 418 and 420.

Screw Drive GP 32 S ∅32 mm, Ball Screw



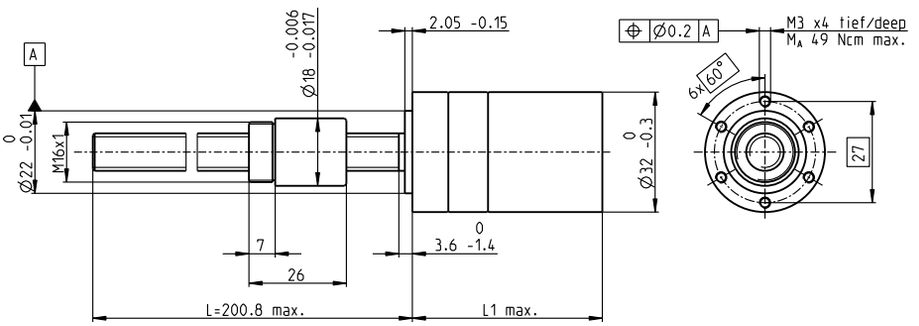
Part Numbers

363970	363971	363974	363979	363980	363985	363990	363995	364000
	363972	363975		363981	363986	363991	363996	364001
	363973	363976		363982	363987	363992	363997	364002
		363977		363983	363988	363993	363998	
		363978		363984	363989	363994	363999	

maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor/brake) + assembly parts								
RE 35, 90 W	139			122.1	122.1	128.8	128.8	135.5	135.5	142.2	142.2	142.2
RE 35, 90 W	139	MR	464	133.5	133.5	140.2	140.2	146.9	146.9	153.6	153.6	153.6
RE 35, 90 W	139	HED_5540	471/473	142.8	142.8	149.5	149.5	156.2	156.2	162.9	162.9	162.9
RE 35, 90 W	139	DCT 22	480	140.2	140.2	146.9	146.9	153.6	153.6	160.3	160.3	160.3
RE 35, 90 W	139	AB 28	519	158.2	158.2	164.9	164.9	171.6	171.6	178.3	178.3	178.3
RE 35, 90 W	139	HEDS 5540/AB 28	471/519	175.4	175.4	182.1	182.1	188.8	188.8	195.5	195.5	195.5
A-max 26	164			–	95.8	102.5	102.5	109.2	109.2	115.9	115.9	115.9
A-max 26	164	MR	463	–	104.6	111.3	111.3	118.0	118.0	124.7	124.7	124.7
A-max 26	164	Enc 22	468	–	110.2	116.9	116.9	123.6	123.6	130.3	130.3	130.3
A-max 26	164	HED_5540	472/474	–	114.2	120.9	120.9	127.6	127.6	134.3	134.3	134.3
A-max 32	165			–	114.0	120.7	120.7	127.4	127.4	134.1	134.1	134.1
A-max 32	166			–	112.6	119.3	119.3	126.0	126.0	132.7	132.7	132.7
A-max 32	166	MR	464	–	123.8	130.5	130.5	137.2	137.2	143.9	143.9	143.9
A-max 32	166	HED_5540	471/473	–	133.4	140.1	140.1	146.8	146.8	153.5	153.5	153.5
EC 32, 80 W	228			111.1	111.1	117.8	117.8	124.5	124.5	131.2	131.2	131.2
EC 32, 80 W	228	HED_5540	471/473	129.5	129.5	136.2	136.2	142.9	142.9	149.6	149.6	149.6
EC 32, 80 W	228	Res 26	481	131.2	131.2	137.9	137.9	144.6	144.6	151.3	151.3	151.3
EC-max 22, 25 W	239			–	99.6	106.3	106.3	113.0	113.0	119.7	119.7	119.7
EC-max 22, 25 W	239	MR	464	–	109.3	116.0	116.0	122.7	122.7	129.4	129.4	129.4
EC-max 22, 25 W	239	AB 20	516	–	135.4	142.1	142.1	148.8	148.8	155.5	155.5	155.5
EC-max 30, 40 W	240			–	93.1	99.8	99.8	106.5	106.5	113.2	113.2	113.2
EC-max 30, 40 W	240	MR	464	–	105.3	112.0	112.0	118.7	118.7	125.4	125.4	125.4
EC-max 30, 40 W	240	HEDL 5540	474	–	113.7	120.4	120.4	127.1	127.1	133.8	133.8	133.8
EC-max 30, 40 W	240	AB 20	516	–	128.9	135.6	135.6	142.3	142.3	148.3	148.3	148.3
EC-max 30, 40 W	240	HEDL 5540/AB 20	474/516	–	149.5	156.2	156.2	162.9	162.9	169.6	169.6	169.6
EC-4pole 22, 90 W	247			99.7	99.7	106.4	106.4	113.1	113.1	119.8	119.8	119.8
EC-4pole 22, 90 W	247	16 EASY/XT/Abs.	449–453	111.9	111.9	118.6	118.6	125.3	125.3	132.0	132.0	132.0
EC-4pole 22, 90 W	247	16 EASY Abs. XT	455	112.4	112.4	119.1	119.1	125.8	125.8	132.5	132.5	132.5
EC-4pole 22, 90 W	247	16 RIO	466	110.4	110.4	117.1	117.1	123.8	123.8	130.5	130.5	130.5
EC-4pole 22, 90 W	247	AEDL/HEDL	469/475	121.2	121.2	127.9	127.9	134.6	134.6	141.3	141.3	141.3
EC-4pole 22,120 W	248			117.1	117.1	123.8	123.8	130.5	130.5	137.2	137.2	137.2
EC-4pole 22,120 W	248	16 EASY/XT/Abs.	449–453	129.3	129.3	136.0	136.0	142.7	142.7	149.4	149.4	149.4
EC-4pole 22,120 W	248	16 EASY Abs. XT	455	129.8	129.8	136.5	136.5	143.2	143.2	149.9	149.9	149.9
EC-4pole 22,120 W	248	16 RIO	466	127.8	127.8	134.5	134.5	141.2	141.2	147.9	147.9	147.9
EC-4pole 22,120 W	248	AEDL/HEDL	469/475	138.6	138.6	145.3	145.3	152.0	152.0	158.7	158.7	158.7
EC-i 30, 30 W	258			93.3	93.3	100.0	100.0	106.7	106.7	113.4	113.4	113.4
EC-i 30, 30 W	258	16 EASY/Abs.	449/453	105.0	105.0	111.7	111.7	118.4	118.4	125.1	125.1	125.1
EC-i 30, 30 W	258	16 RIO	466	103.5	103.5	110.2	110.2	116.9	116.9	123.6	123.6	123.6
EC-i 30, 30 W	258	AEDL/HEDL	469/474	114.0	114.0	120.7	120.7	127.4	127.4	134.1	134.1	134.1
EC-i 30, 45 W	259			93.3	93.3	100.0	100.0	106.7	106.7	113.4	113.4	113.4
EC-i 30, 45 W	259	16 EASY/Abs.	449/453	105.0	105.0	111.7	111.7	118.4	118.4	125.1	125.1	125.1
EC-i 30, 45 W	259	16 RIO	466	103.5	103.5	110.2	110.2	116.9	116.9	123.6	123.6	123.6
EC-i 30, 45 W	259	AEDL/HEDL	469/474	114.0	114.0	120.7	120.7	127.4	127.4	134.1	134.1	134.1
EC-i 30, 50 W	260			115.3	115.3	122.0	122.0	128.7	128.7	135.4	135.4	135.4
EC-i 30, 50 W	260	16 EASY/Abs.	449/453	127.0	127.0	133.7	133.7	140.4	140.4	147.1	147.1	147.1
EC-i 30, 50 W	260	16 RIO	466	125.5	125.5	132.2	132.2	138.9	138.9	145.6	145.6	145.6
EC-i 30, 50 W	260	AEDL/HEDL	469/474	136.0	136.0	142.7	142.7	149.4	149.4	156.1	156.1	156.1
EC-i 30, 75 W	261			115.3	115.3	122.0	122.0	128.7	128.7	135.4	135.4	135.4
EC-i 30, 75 W	261	16 EASY/Abs.	449/453	127.0	127.0	133.7	133.7	140.4	140.4	147.1	147.1	147.1
EC-i 30, 75 W	261	16 RIO	466	125.5	125.5	132.2	132.2	138.9	138.9	145.6	145.6	145.6
EC-i 30, 75 W	261	AEDL/HEDL	469/474	136.0	136.0	142.7	142.7	149.4	149.4	156.1	156.1	156.1
EC-i 40, 50 W	262			82.7	82.7	89.4	89.4	96.1	96.1	102.8	102.8	102.8
EC-i 40, 50 W	262	16 EASY/Abs.	449/453	94.4	94.4	101.1	101.1	107.8	107.8	114.5	114.5	114.5
EC-i 40, 50 W	262	16 RIO	466	97.2	97.2	103.9	103.9	110.6	110.6	117.3	117.3	117.3
EC-i 40, 50 W	262	AEDL/HEDL	469/474	105.7	105.7	112.4	112.4	119.1	119.1	125.8	125.8	125.8
EC-i 40, 70 W	264			92.7	92.7	99.4	99.4	106.1	106.1	112.8	112.8	112.8
EC-i 40, 70 W	264	16 EASY/Abs.	449/453	104.4	104.4	111.1	111.1	117.8	117.8	124.5	124.5	124.5
EC-i 40, 70 W	264	16 RIO	466	107.2	107.2	113.9	113.9	120.6	120.6	127.3	127.3	127.3
EC-i 40, 70 W	264	AEDL/HEDL	469/474	115.7	115.7	122.4	122.4	129.1	129.1	135.8	135.8	135.8

Screw Drive GP 32 S ∅32 mm, Metric Lead Screw



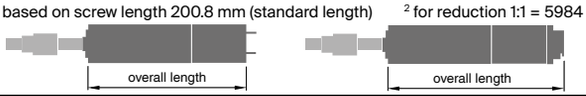
M 1:2

Technical Data						
Screw	M10 x 1, stainless steel					
Standard length	200.8 mm					
Special length (5 mm steps)	max. 600 mm					
Nut (standard)	thread nut					
Material	bronze					
Axial play	< 0.008 mm					
Planetary gearhead	straight teeth					
Bearing	ball bearing/thrust roller bearing					
Radial play, 5 mm from flange	< 0.05 mm					
Axial play	preloaded					
Max. continuous input speed[2]	8000 rpm					
Recommended temperature range	-15...+80°C					
Max. axial load (static)[1]	2700 N					
Number of stages	0	1	2	3	4	
Max. radial load, 15 mm from flange	200 N	200 N	350 N	400 N	400 N	

Stock program
Standard program
Special program (on request)

			Part Numbers								
			363900	363901	363904	363909	363910	363915	363920	363925	363930
Screw Drive Data											
1	Reduction		1:1	3.7:1	14:1	33:1	51:1	111:1	246:1	492:1	762:1
2	Absolute reduction		1/1	26/7	676/49	529/16	17576/343	13824/125	421824/1715	86112/175	19044/25
20	Max. feed velocity[1]	mm/s	100	36	9.5	4.0	2.6	1.2	0.5	0.3	0.2
21	Max. feed force (continuous)[1]	N	183	257	400	533	616	798	1040	1311	1350
22	Max. feed force (intermittent)[1]	N	455	638	995	1324	1350	1350	1350	1350	1350
	Part Numbers			363902	363905		363911	363916	363921	363926	363931
1	Reduction			4.8:1	18:1		66:1	123:1	295:1	531:1	913:1
2	Absolute reduction			24/5	624/35		16224/245	6877/56	101062/343	331776/625	36501/40
20	Max. feed velocity[1]	mm/s		28	7.4		2.0	1.1	0.5	0.3	0.1
21	Max. feed force (continuous)[1]	N		280	435		671	826	1105	1345	1350
22	Max. feed force (intermittent)[1]	N		696	1082		1350	1350	1350	1350	1350
	Part Numbers			363903	363906		363912	363917	363922	363927	363932
1	Reduction			5.8:1	21:1		79:1	132:1	318:1	589:1	1093:1
2	Absolute reduction			23/4	299/14		3887/49	3312/25	389376/1225	20631/35	279841/256
20	Max. feed velocity[1]	mm/s		23	6.3		1.7	1.0	0.4	0.2	0.1
21	Max. feed force (continuous)[1]	N		298	458		712	845	1133	1350	1350
22	Max. feed force (intermittent)[1]	N		742	1139		1350	1350	1350	1350	1350
	Part Numbers				363907		363913	363918	363923	363928	
1	Reduction				23:1		86:1	159:1	411:1	636:1	
2	Absolute reduction				576/25		14976/175	1587/10	359424/875	79488/125	
20	Max. feed velocity[1]	mm/s			5.8		1.6	0.8	0.3	0.2	
21	Max. feed force (continuous)[1]	N			472		733	899	1234	1350	
22	Max. feed force (intermittent)[1]	N			1174		1350	1350	1350	1350	
	Part Numbers				363908		363914	363919	363924	363929	
1	Reduction				28:1		103:1	190:1	456:1	706:1	
2	Absolute reduction				138/5		3588/35	12167/64	89401/196	158171/224	
20	Max. feed velocity[1]	mm/s			4.8		1.3	0.7	0.3	0.2	
21	Max. feed force (continuous)[1]	N			504		778	955	1278	1350	
22	Max. feed force (intermittent)[1]	N			1253		1350	1350	1350	1350	
4	Number of stages		0	1	2	2	3	3	4	4	4
7	Max. efficiency gearhead incl. screw	%	27	22	20	20	19	19	16	16	16
8	Weight[1]	g	304	304	331	331	359	359	387	387	387
9	Average backlash no load	°	0.7	0.7	0.8	0.8	1.0	1.0	1.0	1.0	1.0
23	Mechanical positioning accuracy[1]	mm	0.033	0.033	0.033	0.033	0.034	0.034	0.034	0.034	0.034
10	Mass inertia gearhead incl. screw[1]	gcm²	43.3	3.0	0.9	0.9	0.7	0.7	0.7	0.7	0.7
11	Gearhead length L1	mm	51.0	51.0	57.7	57.7	64.4	64.4	71.1	71.1	71.1

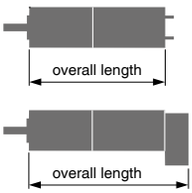
[1] based on screw length 200.8 mm (standard length) [2] for reduction 1:1 = 5984 rpm



maxon Modular System

+ Motor	Page	+ Sensor / Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts								
RE 25	134/136			105.6	105.6	112.3	112.3	119.0	119.0	125.7	125.7	125.7
RE 25	134/136	MR	463	116.6	116.6	123.3	123.3	130.0	130.0	136.7	136.7	136.7
RE 25	134/136	Enc 22	468	119.7	119.7	126.4	126.4	133.1	133.1	139.8	139.8	139.8
RE 25	134/136	HED_5540	471/473	126.4	126.4	133.1	133.1	139.8	139.8	146.5	146.5	146.5
RE 25	134/136	DCT 22	480	127.9	127.9	134.6	134.6	141.3	141.3	148.0	148.0	148.0
RE 25, 20 W	135			94.1	94.1	100.8	100.8	107.5	107.5	114.2	114.2	114.2
RE 25, 20 W	135	MR	463	105.1	105.1	111.8	111.8	118.5	118.5	125.2	125.2	125.2
RE 25, 20 W	135	HED_5540	471/473	114.9	114.9	121.6	121.6	128.3	128.3	135.0	135.0	135.0
RE 25, 20 W	135	DCT 22	480	116.4	116.4	123.1	123.1	129.8	129.8	136.5	136.5	136.5
RE 25, 20 W	135	AB 28	519	128.2	128.2	134.9	134.9	141.6	141.6	148.3	148.3	148.3
RE 25, 20 W	135	HED_5540/AB 28	471/519	145.4	145.4	152.1	152.1	158.8	158.8	165.5	165.5	165.5
RE 25, 20 W	136	AB 28	519	139.7	139.7	146.4	146.4	153.1	153.1	159.8	159.8	159.8
RE 25, 20 W	136	HED_5540/AB 28	471/519	156.9	156.9	163.6	163.6	170.3	170.3	177.0	177.0	177.0
RE 30, 60 W	138			119.1	119.1	125.8	125.8	132.5	132.5	139.2	139.2	139.2
RE 30, 60 W	138	MR	464	130.5	130.5	137.2	137.2	143.9	143.9	150.6	150.6	150.6
RE 30, 60 W	138	HED_5540	471/473	139.9	139.9	146.6	146.6	153.3	153.3	160.0	160.0	160.0

Screw Drive GP 32 S ∅32 mm, Metric Lead Screw



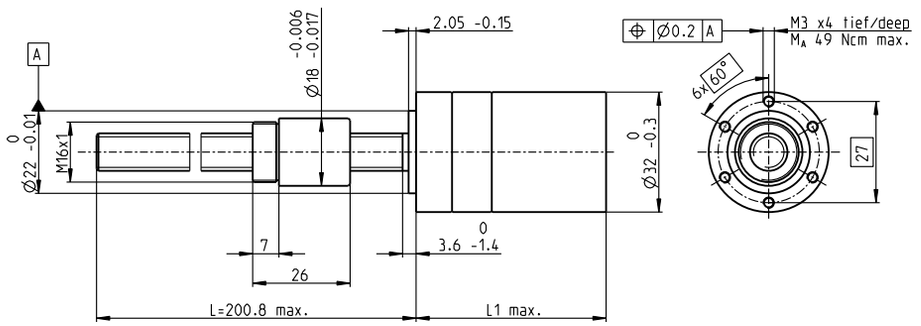
Part Numbers

363900	363901	363904	363909	363910	363915	363920	363925	363930
	363902	363905		363911	363916	363921	363926	363931
	363903	363906		363912	363917	363922	363927	363932
		363907		363913	363918	363923	363928	
		363908		363914	363919	363924	363929	

maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor/brake) + assembly parts								
RE 35, 90 W	139			122.1	122.1	128.8	128.8	135.5	135.5	142.2	142.2	142.2
RE 35, 90 W	139	MR	464	133.5	133.5	140.2	140.2	146.9	146.9	153.6	153.6	153.6
RE 35, 90 W	139	HED_5540	471/473	142.8	142.8	149.5	149.5	156.2	156.2	162.9	162.9	162.9
RE 35, 90 W	139	DCT 22	480	140.2	140.2	146.9	146.9	153.6	153.6	160.3	160.3	160.3
RE 35, 90 W	139	AB 28	519	158.2	158.2	164.9	164.9	171.6	171.6	178.3	178.3	178.3
RE 35, 90 W	139	HEDS 5540/AB 28	471/519	175.4	175.4	182.1	182.1	188.8	188.8	195.5	195.5	195.5
A-max 26	164			–	95.8	102.5	102.5	109.2	109.2	115.9	115.9	115.9
A-max 26	164	MR	463	–	104.6	111.3	111.3	118.0	118.0	124.7	124.7	124.7
A-max 26	164	Enc 22	468	–	110.2	116.9	116.9	123.6	123.6	130.3	130.3	130.3
A-max 26	164	HED_5540	472/474	–	114.2	120.9	120.9	127.6	127.6	134.3	134.3	134.3
A-max 32	165			–	114.0	120.7	120.7	127.4	127.4	134.1	134.1	134.1
A-max 32	166			–	112.6	119.3	119.3	126.0	126.0	132.7	132.7	132.7
A-max 32	166	MR	464	–	123.8	130.5	130.5	137.2	137.2	143.9	143.9	143.9
A-max 32	166	HED_5540	471/473	–	133.4	140.1	140.1	146.8	146.8	153.5	153.5	153.5
EC 32, 80 W	228			111.1	111.1	117.8	117.8	124.5	124.5	131.2	131.2	131.2
EC 32, 80 W	228	HED_5540	471/473	129.5	129.5	136.2	136.2	142.9	142.9	149.6	149.6	149.6
EC 32, 80 W	228	Res 26	481	131.2	131.2	137.9	137.9	144.6	144.6	151.3	151.3	151.3
EC-max 22, 25 W	239			–	99.6	106.3	106.3	113.0	113.0	119.7	119.7	119.7
EC-max 22, 25 W	239	MR	464	–	109.3	116.0	116.0	122.7	122.7	129.4	129.4	129.4
EC-max 22, 25 W	239	AB 20	516	–	135.4	142.1	142.1	148.8	148.8	155.5	155.5	155.5
EC-max 30, 40 W	240			–	93.1	99.8	99.8	106.5	106.5	113.2	113.2	113.2
EC-max 30, 40 W	240	MR	464	–	105.3	112.0	112.0	118.7	118.7	125.4	125.4	125.4
EC-max 30, 40 W	240	HEDL 5540	474	–	113.7	120.4	120.4	127.1	127.1	133.8	133.8	133.8
EC-max 30, 40 W	240	AB 20	516	–	128.9	135.6	135.6	142.3	142.3	148.3	148.3	148.3
EC-max 30, 40 W	240	HEDL 5540/AB 20	474/516	–	149.5	156.2	156.2	162.9	162.9	169.6	169.6	169.6
EC-4pole 22, 90 W	247			99.7	99.7	106.4	106.4	113.1	113.1	119.8	119.8	119.8
EC-4pole 22, 90 W	247	16 EASY/XT/Abs.	449–453	111.9	111.9	118.6	118.6	125.3	125.3	132.0	132.0	132.0
EC-4pole 22, 90 W	247	16 EASY Abs. XT	455	112.4	112.4	119.1	119.1	125.8	125.8	132.5	132.5	132.5
EC-4pole 22, 90 W	247	16 RIO	466	110.4	110.4	117.1	117.1	123.8	123.8	130.5	130.5	130.5
EC-4pole 22, 90 W	247	AEDL/HEDL	469/475	121.2	121.2	127.9	127.9	134.6	134.6	141.3	141.3	141.3
EC-4pole 22,120 W	248			117.1	117.1	123.8	123.8	130.5	130.5	137.2	137.2	137.2
EC-4pole 22,120 W	248	16 EASY/XT/Abs.	449–453	129.3	129.3	136.0	136.0	142.7	142.7	149.4	149.4	149.4
EC-4pole 22,120 W	248	16 EASY Abs. XT	455	129.8	129.8	136.5	136.5	143.2	143.2	149.9	149.9	149.9
EC-4pole 22,120 W	248	16 RIO	466	127.8	127.8	134.5	134.5	141.2	141.2	147.9	147.9	147.9
EC-4pole 22,120 W	248	AEDL/HEDL	469/475	138.6	138.6	145.3	145.3	152.0	152.0	158.7	158.7	158.7
EC-i 30, 30 W	258			93.3	93.3	100.0	100.0	106.7	106.7	113.4	113.4	113.4
EC-i 30, 30 W	258	16 EASY/Abs.	449/453	105.0	105.0	111.7	111.7	118.4	118.4	125.1	125.1	125.1
EC-i 30, 30 W	258	16 RIO	466	103.5	103.5	110.2	110.2	116.9	116.9	123.6	123.6	123.6
EC-i 30, 30 W	258	AEDL/HEDL	469/474	114.0	114.0	120.7	120.7	127.4	127.4	134.1	134.1	134.1
EC-i 30, 45 W	259			93.3	93.3	100.0	100.0	106.7	106.7	113.4	113.4	113.4
EC-i 30, 45 W	259	16 EASY/Abs.	449/453	105.0	105.0	111.7	111.7	118.4	118.4	125.1	125.1	125.1
EC-i 30, 45 W	259	16 RIO	466	103.5	103.5	110.2	110.2	116.9	116.9	123.6	123.6	123.6
EC-i 30, 45 W	259	AEDL/HEDL	469/474	114.0	114.0	120.7	120.7	127.4	127.4	134.1	134.1	134.1
EC-i 30, 50 W	260			115.3	115.3	122.0	122.0	128.7	128.7	135.4	135.4	135.4
EC-i 30, 50 W	260	16 EASY/Abs.	449/453	127.0	127.0	133.7	133.7	140.4	140.4	147.1	147.1	147.1
EC-i 30, 50 W	260	16 RIO	466	125.5	125.5	132.2	132.2	138.9	138.9	145.6	145.6	145.6
EC-i 30, 50 W	260	AEDL/HEDL	469/474	136.0	136.0	142.7	142.7	149.4	149.4	156.1	156.1	156.1
EC-i 30, 75 W	261			115.3	115.3	122.0	122.0	128.7	128.7	135.4	135.4	135.4
EC-i 30, 75 W	261	16 EASY/Abs.	449/453	127.0	127.0	133.7	133.7	140.4	140.4	147.1	147.1	147.1
EC-i 30, 75 W	261	16 RIO	466	125.5	125.5	132.2	132.2	138.9	138.9	145.6	145.6	145.6
EC-i 30, 75 W	261	AEDL/HEDL	469/474	136.0	136.0	142.7	142.7	149.4	149.4	156.1	156.1	156.1
EC-i 40, 50 W	262			82.7	82.7	89.4	89.4	96.1	96.1	102.8	102.8	102.8
EC-i 40, 50 W	262	16 EASY/Abs.	449/453	94.4	94.4	101.1	101.1	107.8	107.8	114.5	114.5	114.5
EC-i 40, 50 W	262	16 RIO	466	97.2	97.2	103.9	103.9	110.6	110.6	117.3	117.3	117.3
EC-i 40, 50 W	262	AEDL/HEDL	469/474	105.7	105.7	112.4	112.4	119.1	119.1	125.8	125.8	125.8
EC-i 40, 70 W	264			92.7	92.7	99.4	99.4	106.1	106.1	112.8	112.8	112.8
EC-i 40, 70 W	264	16 EASY/Abs.	449/453	104.4	104.4	111.1	111.1	117.8	117.8	124.5	124.5	124.5
EC-i 40, 70 W	264	16 RIO	466	107.2	107.2	113.9	113.9	120.6	120.6	127.3	127.3	127.3
EC-i 40, 70 W	264	AEDL/HEDL	469/474	115.7	115.7	122.4	122.4	129.1	129.1	135.8	135.8	135.8

Screw Drive GP 32 S ∅32 mm, Trapezoidal Lead Screw



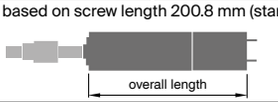
M 1:2

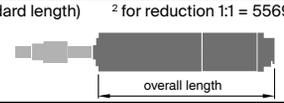
Technical Data						
Screw						TR10 x 2, stainless steel
Standard length						200.8 mm
Special length (5 mm steps)						max. 600 mm
Nut (standard)						thread nut
Material						bronze
Axial play						< 0.008 mm
Planetary gearhead						straight teeth
Bearing						ball bearing/thrust roller bearing
Radial play, 5 mm from flange						< 0.05 mm
Axial play						preloaded
Max. continuous input speed[2]						8000 rpm
Recommended temperature range						-15...+80°C
Max. axial load (static)[1]						2700 N
Number of stages	0	1	2	3	4	
Max. radial load, 15 mm from flange	200 N	200 N	350 N	400 N	400 N	

Stock program
Standard program
Special program (on request)

			Part Numbers								
			363936	363937	363940	363945	363946	363951	363956	363961	363966
Screw Drive Data											
1	Reduction		1:1	3.7:1	14:1	33:1	51:1	111:1	246:1	492:1	762:1
2	Absolute reduction		1/1	26/7	676/49	529/16	17576/343	13824/125	421824/1715	86112/175	19044/25
20	Max. feed velocity[1]	mm/s	186	72	19	8.1	5.2	2.4	1.1	0.5	0.3
21	Max. feed force (continuous)[1]	N	216	296	462	614	710	921	1200	1512	1530
22	Max. feed force (intermittent)[1]	N	528	723	1127	1500	1530	1530	1530	1530	1530
	Part Numbers			363938	363941		363947	363952	363957	363962	363967
1	Reduction			4.8:1	18:1		66:1	123:1	295:1	531:1	913:1
2	Absolute reduction			24/5	624/35		16224/245	6877/56	101062/343	331776/625	36501/40
20	Max. feed velocity[1]	mm/s		56	15		4.0	2.2	0.9	0.5	0.3
21	Max. feed force (continuous)[1]	N		323	502		774	953	1275	1530	1530
22	Max. feed force (intermittent)[1]	N		789	1226		1530	1530	1530	1530	1530
	Part Numbers			363939	363942		363948	363953	363958	363963	363968
1	Reduction			5.8:1	21:1		79:1	132:1	318:1	589:1	1093:1
2	Absolute reduction			23/4	299/14		3887/49	3312/25	389376/1225	20631/35	279841/256
20	Max. feed velocity[1]	mm/s		46	13		3.4	2.0	0.8	0.5	0.2
21	Max. feed force (continuous)[1]	N		344	529		822	975	1308	1530	1530
22	Max. feed force (intermittent)[1]	N		840	1291		1530	1530	1530	1530	1530
	Part Numbers				363943		363949	363954	363959	363964	
1	Reduction				23:1		86:1	159:1	411:1	636:1	
2	Absolute reduction				576/25		14976/175	1587/10	359424/875	79488/125	
20	Max. feed velocity[1]	mm/s			12		3.1	1.7	0.6	0.4	
21	Max. feed force (continuous)[1]	N			545		846	1038	1424	1530	
22	Max. feed force (intermittent)[1]	N			1330		1530	1530	1530	1530	
	Part Numbers				363944		363950	363955	363960	363965	
1	Reduction				28:1		103:1	190:1	456:1	706:1	
2	Absolute reduction				138/5		3588/35	12167/64	89401/196	158171/224	
20	Max. feed velocity[1]	mm/s			9.5		1.3	0.7	0.3	0.2	
21	Max. feed force (continuous)[1]	N			582		898	1101	1475	1530	
22	Max. feed force (intermittent)[1]	N			1420		1530	1530	1530	1530	
4	Number of stages		0	1	2	2	3	3	4	4	4
7	Max. efficiency gearhead incl. screw	%	47	38	35	35	33	33	28	28	28
8	Weight[1]	g	304	304	331	331	359	359	387	387	387
9	Average backlash no load	°	0.7	0.7	0.8	0.8	1.0	1.0	1.0	1.0	1.0
23	Mechanical positioning accuracy[1]	mm	0.035	0.035	0.035	0.035	0.037	0.037	0.037	0.037	0.037
10	Mass inertia gearhead incl. screw[1]	gcm²	42.3	2.4	0.9	0.9	1.0	1.0	1.0	1.0	1.0
11	Gearhead length L1	mm	51.0	51.0	57.7	57.7	64.4	64.4	71.1	71.1	71.1

[1] based on screw length 200.8 mm (standard length) [2] for reduction 1:1 = 5569 rpm



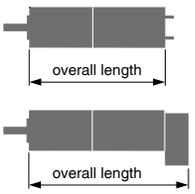


maxon Modular System

Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts

+ Motor	Page	+ Sensor / Brake	Page								
RE 25	134/136			105.6	105.6	112.3	112.3	119.0	119.0	125.7	125.7	125.7
RE 25	134/136	MR	463	116.6	116.6	123.3	123.3	130.0	130.0	136.7	136.7	136.7
RE 25	134/136	Enc 22	468	119.7	119.7	126.4	126.4	133.1	133.1	139.8	139.8	139.8
RE 25	134/136	HED_5540	471/473	126.4	126.4	133.1	133.1	139.8	139.8	146.5	146.5	146.5
RE 25	134/136	DCT 22	480	127.9	127.9	134.6	134.6	141.3	141.3	148.0	148.0	148.0
RE 25, 20 W	135			94.1	94.1	100.8	100.8	107.5	107.5	114.2	114.2	114.2
RE 25, 20 W	135	MR	463	105.1	105.1	111.8	111.8	118.5	118.5	125.2	125.2	125.2
RE 25, 20 W	135	HED_5540	471/473	114.9	114.9	121.6	121.6	128.3	128.3	135.0	135.0	135.0
RE 25, 20 W	135	DCT 22	480	116.4	116.4	123.1	123.1	129.8	129.8	136.5	136.5	136.5
RE 25, 20 W	135	AB 28	519	128.2	128.2	134.9	134.9	141.6	141.6	148.3	148.3	148.3
RE 25, 20 W	135	HED_5540/AB 28	471/519	145.4	145.4	152.1	152.1	158.8	158.8	165.5	165.5	165.5
RE 25, 20 W	136	AB 28	519	139.7	139.7	146.4	146.4	153.1	153.1	159.8	159.8	159.8
RE 25, 20 W	136	HED_5540/AB 28	471/519	156.9	156.9	163.6	163.6	170.3	170.3	177.0	177.0	177.0
RE 30, 60 W	138			119.1	119.1	125.8	125.8	132.5	132.5	139.2	139.2	139.2
RE 30, 60 W	138	MR	464	130.5	130.5	137.2	137.2	143.9	143.9	150.6	150.6	150.6
RE 30, 60 W	138	HED_5540	471/473	139.9	139.9	146.6	146.6	153.3	153.3	160.0	160.0	160.0

Screw Drive GP 32 S ∅32 mm, Trapezoidal Lead Screw



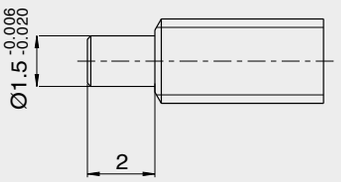
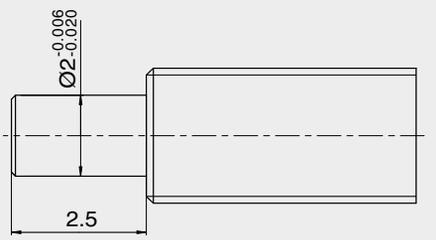
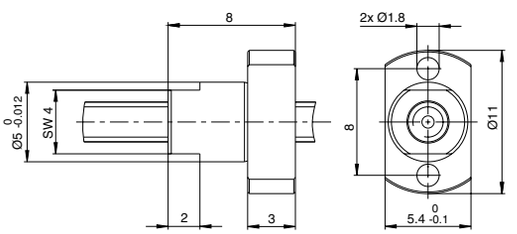
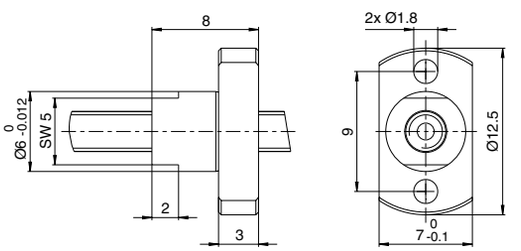
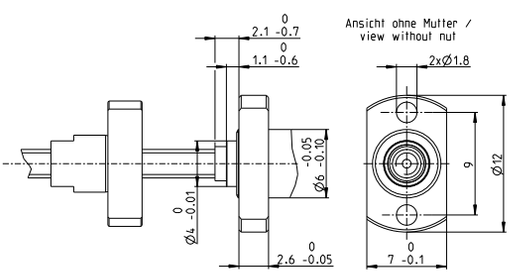
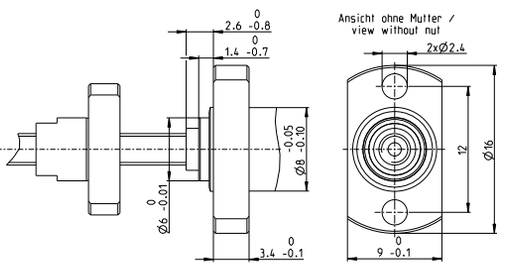
Part Numbers

363936	363937	363940	363945	363946	363951	363956	363961	363966
	363938	363941		363947	363952	363957	363962	363967
	363939	363942		363948	363953	363958	363963	363968
		363943		363949	363954	363959	363964	
		363944		363950	363955	363960	363965	

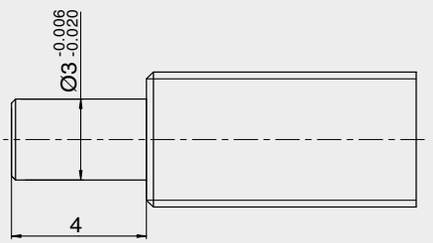
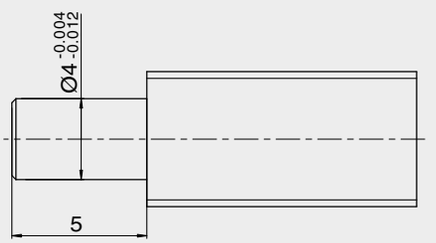
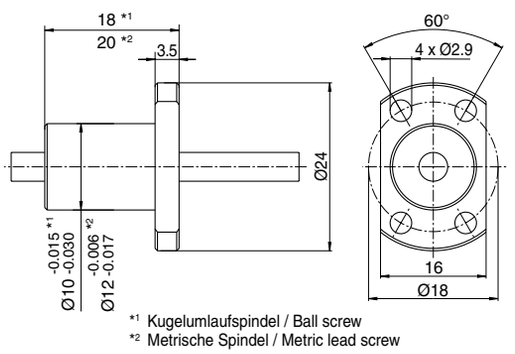
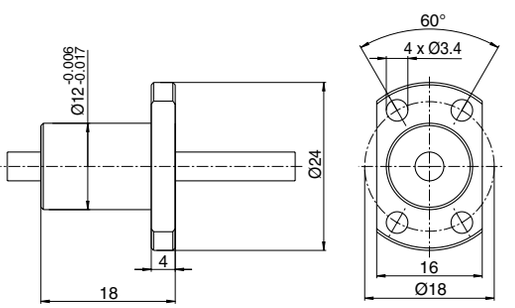
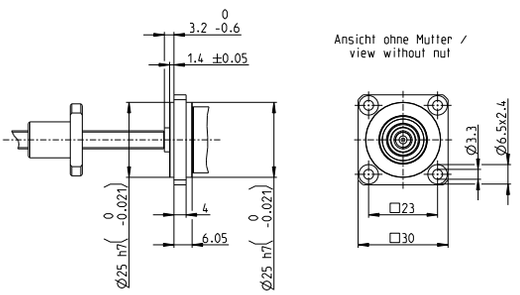
maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor/brake) + assembly parts								
RE 35, 90 W	139			122.1	122.1	128.8	128.8	135.5	135.5	142.2	142.2	142.2
RE 35, 90 W	139	MR	464	133.5	133.5	140.2	140.2	146.9	146.9	153.6	153.6	153.6
RE 35, 90 W	139	HED_5540	471/473	142.8	142.8	149.5	149.5	156.2	156.2	162.9	162.9	162.9
RE 35, 90 W	139	DCT 22	480	140.2	140.2	146.9	146.9	153.6	153.6	160.3	160.3	160.3
RE 35, 90 W	139	AB 28	519	158.2	158.2	164.9	164.9	171.6	171.6	178.3	178.3	178.3
RE 35, 90 W	139	HEDS 5540/AB 28	471/519	175.4	175.4	182.1	182.1	188.8	188.8	195.5	195.5	195.5
A-max 26	164			–	95.8	102.5	102.5	109.2	109.2	115.9	115.9	115.9
A-max 26	164	MR	463	–	104.6	111.3	111.3	118.0	118.0	124.7	124.7	124.7
A-max 26	164	Enc 22	468	–	110.2	116.9	116.9	123.6	123.6	130.3	130.3	130.3
A-max 26	164	HED_5540	472/474	–	114.2	120.9	120.9	127.6	127.6	134.3	134.3	134.3
A-max 32	165			–	114.0	120.7	120.7	127.4	127.4	134.1	134.1	134.1
A-max 32	166			–	112.6	119.3	119.3	126.0	126.0	132.7	132.7	132.7
A-max 32	166	MR	464	–	123.8	130.5	130.5	137.2	137.2	143.9	143.9	143.9
A-max 32	166	HED_5540	471/473	–	133.4	140.1	140.1	146.8	146.8	153.5	153.5	153.5
EC 32, 80 W	228			111.1	111.1	117.8	117.8	124.5	124.5	131.2	131.2	131.2
EC 32, 80 W	228	HED_5540	471/473	129.5	129.5	136.2	136.2	142.9	142.9	149.6	149.6	149.6
EC 32, 80 W	228	Res 26	481	131.2	131.2	137.9	137.9	144.6	144.6	151.3	151.3	151.3
EC-max 22, 25 W	239			–	99.6	106.3	106.3	113.0	113.0	119.7	119.7	119.7
EC-max 22, 25 W	239	MR	464	–	109.3	116.0	116.0	122.7	122.7	129.4	129.4	129.4
EC-max 22, 25 W	239	AB 20	516	–	135.4	142.1	142.1	148.8	148.8	155.5	155.5	155.5
EC-max 30, 40 W	240			–	93.1	99.8	99.8	106.5	106.5	113.2	113.2	113.2
EC-max 30, 40 W	240	MR	464	–	105.3	112.0	112.0	118.7	118.7	125.4	125.4	125.4
EC-max 30, 40 W	240	HEDL 5540	474	–	113.7	120.4	120.4	127.1	127.1	133.8	133.8	133.8
EC-max 30, 40 W	240	AB 20	516	–	128.9	135.6	135.6	142.3	142.3	148.3	148.3	148.3
EC-max 30, 40 W	240	HEDL 5540/AB 20	474/516	–	149.5	156.2	156.2	162.9	162.9	169.6	169.6	169.6
EC-4pole 22, 90 W	247			99.7	99.7	106.4	106.4	113.1	113.1	119.8	119.8	119.8
EC-4pole 22, 90 W	247	16 EASY/XT/Abs.	449–453	111.9	111.9	118.6	118.6	125.3	125.3	132.0	132.0	132.0
EC-4pole 22, 90 W	247	16 EASY Abs. XT	455	112.4	112.4	119.1	119.1	125.8	125.8	132.5	132.5	132.5
EC-4pole 22, 90 W	247	16 RIO	466	110.4	110.4	117.1	117.1	123.8	123.8	130.5	130.5	130.5
EC-4pole 22, 90 W	247	AEDL/HEDL	469/475	121.2	121.2	127.9	127.9	134.6	134.6	141.3	141.3	141.3
EC-4pole 22,120 W	248			117.1	117.1	123.8	123.8	130.5	130.5	137.2	137.2	137.2
EC-4pole 22,120 W	248	16 EASY/XT/Abs.	449–453	129.3	129.3	136.0	136.0	142.7	142.7	149.4	149.4	149.4
EC-4pole 22,120 W	248	16 EASY Abs. XT	455	129.8	129.8	136.5	136.5	143.2	143.2	149.9	149.9	149.9
EC-4pole 22,120 W	248	16 RIO	466	127.8	127.8	134.5	134.5	141.2	141.2	147.9	147.9	147.9
EC-4pole 22,120 W	248	AEDL/HEDL	469/475	138.6	138.6	145.3	145.3	152.0	152.0	158.7	158.7	158.7
EC-i 30, 30 W	258			93.3	93.3	100.0	100.0	106.7	106.7	113.4	113.4	113.4
EC-i 30, 30 W	258	16 EASY/Abs.	449/453	105.0	105.0	111.7	111.7	118.4	118.4	125.1	125.1	125.1
EC-i 30, 30 W	258	16 RIO	466	103.5	103.5	110.2	110.2	116.9	116.9	123.6	123.6	123.6
EC-i 30, 30 W	258	AEDL/HEDL	469/474	114.0	114.0	120.7	120.7	127.4	127.4	134.1	134.1	134.1
EC-i 30, 45 W	259			93.3	93.3	100.0	100.0	106.7	106.7	113.4	113.4	113.4
EC-i 30, 45 W	259	16 EASY/Abs.	449/453	105.0	105.0	111.7	111.7	118.4	118.4	125.1	125.1	125.1
EC-i 30, 45 W	259	16 RIO	466	103.5	103.5	110.2	110.2	116.9	116.9	123.6	123.6	123.6
EC-i 30, 45 W	259	AEDL/HEDL	469/474	114.0	114.0	120.7	120.7	127.4	127.4	134.1	134.1	134.1
EC-i 30, 50 W	260			115.3	115.3	122.0	122.0	128.7	128.7	135.4	135.4	135.4
EC-i 30, 50 W	260	16 EASY/Abs.	449/453	127.0	127.0	133.7	133.7	140.4	140.4	147.1	147.1	147.1
EC-i 30, 50 W	260	16 RIO	466	125.5	125.5	132.2	132.2	138.9	138.9	145.6	145.6	145.6
EC-i 30, 50 W	260	AEDL/HEDL	469/474	136.0	136.0	142.7	142.7	149.4	149.4	156.1	156.1	156.1
EC-i 30, 75 W	261			115.3	115.3	122.0	122.0	128.7	128.7	135.4	135.4	135.4
EC-i 30, 75 W	261	16 EASY/Abs.	449/453	127.0	127.0	133.7	133.7	140.4	140.4	147.1	147.1	147.1
EC-i 30, 75 W	261	16 RIO	466	125.5	125.5	132.2	132.2	138.9	138.9	145.6	145.6	145.6
EC-i 30, 75 W	261	AEDL/HEDL	469/474	136.0	136.0	142.7	142.7	149.4	149.4	156.1	156.1	156.1
EC-i 40, 50 W	262			82.7	82.7	89.4	89.4	96.1	96.1	102.8	102.8	102.8
EC-i 40, 50 W	262	16 EASY/Abs.	449/453	94.4	94.4	101.1	101.1	107.8	107.8	114.5	114.5	114.5
EC-i 40, 50 W	262	16 RIO	466	97.2	97.2	103.9	103.9	110.6	110.6	117.3	117.3	117.3
EC-i 40, 50 W	262	AEDL/HEDL	469/474	105.7	105.7	112.4	112.4	119.1	119.1	125.8	125.8	125.8
EC-i 40, 70 W	264			92.7	92.7	99.4	99.4	106.1	106.1	112.8	112.8	112.8
EC-i 40, 70 W	264	16 EASY/Abs.	449/453	104.4	104.4	111.1	111.1	117.8	117.8	124.5	124.5	124.5
EC-i 40, 70 W	264	16 RIO	466	107.2	107.2	113.9	113.9	120.6	120.6	127.3	127.3	127.3
EC-i 40, 70 W	264	AEDL/HEDL	469/474	115.7	115.7	122.4	122.4	129.1	129.1	135.8	135.8	135.8

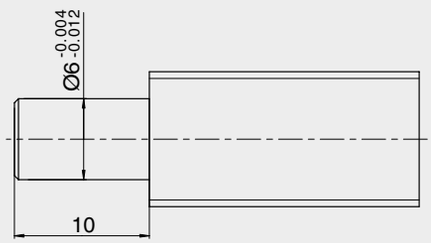
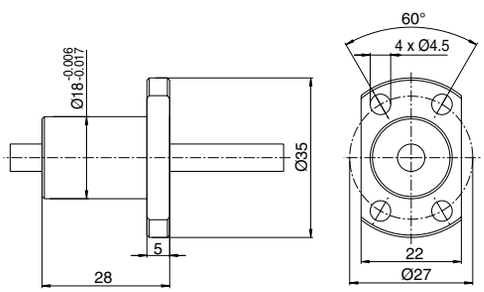
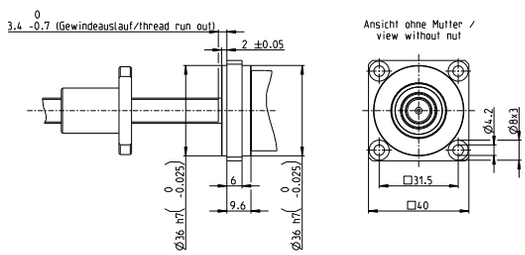
Screw Drive Options

Option	to GP 6 S	to GP 8 S
Special length **Reference FLEX-GEAR-SPIN02/03**	Without specification, the screw is supplied in the standard length 45 mm. Special lengths can be ordered in 5 mm steps up to the stated maximum length.	Without specification, the screw is supplied in the standard length 56 mm. Special lengths can be ordered in 5 mm steps up to the stated maximum length.
FLEX-GEAR-SPIN04/05	Configurable length	Configurable length
Screw end **Reference FLEX-GEAR-SPIN11** In order to support the end of the screw by an additional bearing, it can be delivered according to the illustration. Customer specific screw ends on request.		
Flange nut **Reference FLEX-GEAR-SPIN08** Flange nut instead of the standard thread nut.		
Low backlash ball screw nut **Reference FLEX-GEAR-SPIN09**	Not available for GP 6 S.	Not available for GP 8 S.
Rectangular mounting flange **Reference FLEX-GEAR-SPIN10** Screw drive with rectangular mounting flange allows mounting from the gearhead side.		

Screw Drive Options

Option	to GP 16 S	to GP 22 S
Special length **Reference FLEX-GEAR-SPIN02/03**	Without specification, the screw is supplied in the standard length 102 mm. Special lengths can be ordered in 5 mm steps up to the stated maximum length.	Without specification, the screw is supplied in the standard length 151 mm. Special lengths can be ordered in 5 mm steps up to the stated maximum length.
FLEX-GEAR-SPIN04/05	Configurable length	Configurable length
Screw end **Order reference SPIN11** In order to support the end of the screw by an additional bearing, it can be delivered according to the illustration. Customer specific screw ends on request.		
Flange nut **Reference FLEX-GEAR-SPIN08** Flange nut instead of the standard thread nut. If using a ball screw, the rectangular mounting flange (FLEX-GEAR-SPIN10) must be used.	 *1 Kugelumlaufspindel / Ball screw *2 Metrische Spindel / Metric lead screw	
Low backlash ball screw nut **Reference FLEX-GEAR-SPIN09**	Not available for GP 16 S.	Axial play is almost eliminated through increased preloading of the ball screw nut. Although, the increased load can lead to greater wear.
Rectangular mounting flange **Reference FLEX-GEAR-SPIN10** Screw drive with rectangular mounting flange allows mounting from the gearhead side. If using a ball screw with flange nut, the rectangular assembly flange must be used for mounting.	On request.	

Screw Drive Options

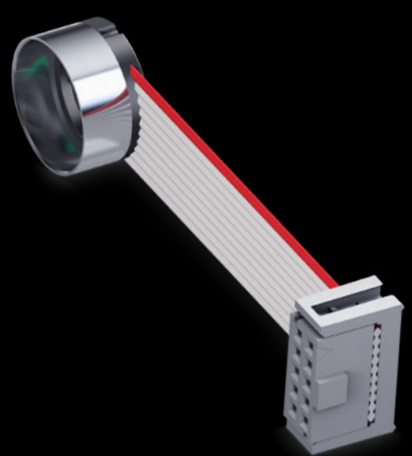
Option	to GP 32 S
Special length **Reference FLEX-GEAR-SPIN02/03**	Without specification, the screw is supplied in the standard length 200.8 mm. Special lengths can be ordered in 5 mm steps up to the stated maximum length.
FLEX-GEAR-SPIN04/05	Configurable length
Screw end **Reference FLEX-GEAR-SPIN11** In order to support the end of the screw by an additional bearing, it can be delivered according to the illustration. Customer specific screw ends on request.	
Flange nut **Reference FLEX-GEAR-SPIN08** Flange nut instead of the standard thread nut. If using a ball screw, the rectangular mounting flange (FLEX-GEAR-SPIN10) must be used.	
Low backlash ball screw nut **Reference FLEX-GEAR-SPIN09**	Axial play is almost eliminated through increased preloading of the ball screw nut. Although, the increased load can lead to greater wear.
Rectangular mounting flange **Reference FLEX-GEAR-SPIN10** Screw drive with rectangular mounting flange allows mounting from the gearhead side. If using a ball screw with flange nut, the rectangular assembly flange must be used for mounting.	

Inductive, magnetic, and optical encoders, DC tachos and resolvers

For medical powertools

Cleanliness is a top priority in medical technology. This is why this drive system can be fully sterilized – from the motor and gearhead through to the encoder. For up to 1000 autoclave cycles. Can be configured online and shipped within 11 days.
sterilizable.maxongroup.com

maxon ENX



maxon ENX encoders make an impression with their robust design and high signal quality. The 3-channel encoders with differential signals guarantee interference-free function even under the very high load, and the optical RIO encoder delivers the highest resolution in a small space. maxon ENX encoders can be configured online and are ready for delivery within 11 working days.

enx.maxongroup.com

ENX 4 MAG
Encoder ∅4 mm, 1...256 CPT

NEW

ENX

Key Data		ENX 4 MAG Incremental, Commutation Signal
Number of channels		3
Max. counts per turn		256
Additional length at motor	mm	2.7
Ambient temperature	°C	-40.. 100
Weight	g	1

Selection criteria	ENX 4 MAG Incremental, Commutation Signal
Speed and rotation direction detection	■
Speed and position control	■
Compact and robust design	■
High resolution	▲
Cost effective	■

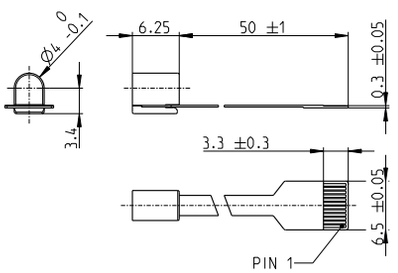
■ suitable ▲ suitable to a limited extent ● not suitable

Specifications		ENX 4 MAG Incremental, Commutation Signal
Supply voltage Vcc	V	3.0.. 3.6
Typical current draw	mA	13
Max. operating frequency	kHz	500
Max. Speed	min^{-1}	100 000
Connection		FPC, 12 pole, pitch 0.5 mm Pin 1 W1 Pin 2 W2 Pin 3 W3 Pin 4 GND Pin 5 V_{CC} Pin 6 Channel A Pin 7 Channel B Pin 8 Channel I Pin 9 H1 Pin 10 H2 Pin 11 H3 Pin 12 Not connect[1] Output signal: CMOS compatible Output current per channel: ±4 mA

Configuration	ENX 4 MAG Incremental, Commutation Signal
Counts per turn[2]	1...256

maxon Modular System	Page
maxon EC motor	
ECX SPEED 4 M	171
ECX SPEED 4 L	172

Dimensions Standard Version



Notes

[1] Applying voltage to these pins may destroy the encoder.

[2] maxon controllers require a resolution of at least 16 pulses.

Compatible connector:
Molex 52745-1297, TE 1-1734839-2
Adapter 498157 required for all maxon controllers

Please note: max. continuous current 0.5 A

xdrives.maxongroup.com

ENX 6 MAG
Encoder ∅6 mm, 1...256 CPT

ENX

Key Data		ENX 6 MAG Incremental	ENX 6 MAG Incremental, Commutation Signal
Number of channels		3	3
Max. counts per turn		256	256
Additional length at motor	mm	6.2	2.1
Ambient temperature	°C	-40...100	-40.. 100
Weight	g	1	1

Selection criteria	ENX 6 MAG Incremental	ENX 6 MAG Incremental, Commutation Signal
Speed and rotation direction detection	■	■
Speed and position control	■	■
Compact and robust design	■	■
High resolution	▲	▲
Cost effective	■	■

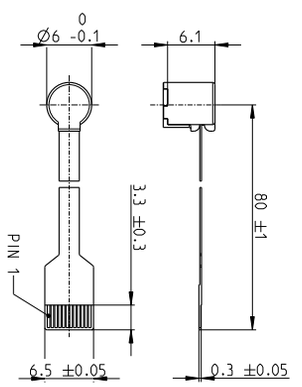
■ suitable ▲ suitable to a limited extent ● not suitable

Specifications		ENX 6 MAG Incremental	ENX 6 MAG Incremental, Commutation Signal
Supply voltage Vcc	V	3.0...3.6	3.0.. 3.6
Typical current draw	mA	13	13
Max. operating frequency	kHz	500	500
Max. Speed	min^{-1}	100 000	100 000
Connection		FPC, 12 pole, pitch 0.5 mm Pin 1 Motor+ Pin 2 Motor- Pin 3 Not connected Pin 4 GND Pin 5 V_{CC} Pin 6 Channel A Pin 7 Channel B Pin 8 Channel I Pin 9-12 Do not connect[1] Output signal: CMOS compatible Output current per channel: ±4 mA	FPC, 12 pole, pitch 0.5 mm Pin 1 W1 Pin 2 W2 Pin 3 W3 Pin 4 GND Pin 5 V_{CC} Pin 6 Channel A Pin 7 Channel B Pin 8 Channel I Pin 9 H1 Pin 10 H2 Pin 11 H3 Pin 12 Not connect[1] Output signal: CMOS compatible Output current per channel: ±4 mA

Configuration	ENX 6 MAG Incremental	ENX 6 MAG Incremental, Commutation Signal
Counts per turn[2]	1...256	1...256

maxon Modular System	Page
maxon DC motor	
DCX 6 M	75
maxon EC motor	
ECX SPEED 6 M	173–174

Dimensions Standard Version



Notes

[1] Applying voltage to these pins may destroy the encoder.

[2] maxon controllers require a resolution of at least 16 pulses.

Compatible connector:
Molex 52745-1297, TE 1-1734839-2
Adapter 498157 required for all maxon controllers

Please note: max. continuous current 0.5 A

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ENX 8 MAG
Encoder ∅8 mm, 1...256 CPT

Key Data		ENX 8 MAG Incremental	ENX 8 MAG Incremental, Commutation Signal
Number of channels		3	3
Max. counts per turn		256	256
Additional length at motor	mm	7.0	1.0
Ambient temperature	°C	-40...100	-40...100
Weight	g	1	1

Selection criteria	ENX 8 MAG Incremental	ENX 8 MAG Incremental, Commutation Signal
Speed and rotation direction detection	■	■
Speed and position control	■	■
Compact and robust design	■	■
High resolution	▲	▲
Cost effective	■	■

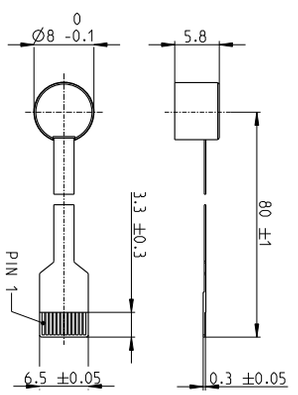
■ suitable ▲ suitable to a limited extent ● not suitable

Specifications		ENX 8 MAG Incremental	ENX 8 MAG Incremental, Commutation Signal
Supply voltage Vcc	V	3.0...3.6	3.0...3.6
Typical current draw	mA	13	13
Max. operating frequency	kHz	500	500
Max. Speed	min^{-1}	100 000	100 000
Connection		FPC, 12 pole, pitch 0.5 mm Pin 1 Motor+ Pin 2 Motor- Pin 3 Not connected Pin 4 GND Pin 5 V_{cc} Pin 6 Channel A Pin 7 Channel B Pin 8 Channel I Pin 9-12 Do not connect[1] Output signal: CMOS compatible Output current per channel: ±4 mA	FPC, 12 pole, pitch 0.5 mm Pin 1 W1 Pin 2 W2 Pin 3 W3 Pin 4 GND Pin 5 V_{cc} Pin 6 Channel A Pin 7 Channel B Pin 8 Channel I Pin 9 H1 Pin 10 H2 Pin 11 H3 Pin 12 Do not connect[1] Output signal: CMOS compatible Output current per channel: ±4 mA

Configuration	ENX 8 MAG Incremental	ENX 8 MAG Incremental, Commutation Signal
Counts per turn[2]	1...256	1...256

maxon Modular System	Page
maxon DC motor	
DCX 8 M	76
maxon EC motor	
ECX SPEED 8 M	175–176

Dimensions Standard Version



Notes

[1] Applying voltage to these pins may destroy the encoder.

[2] maxon controllers require a resolution of at least 16 pulses.

Compatible connector:
Molex 52745-1297, TE 1-1734839-2
Adapter 498157 required for all maxon controllers

Please note: max. continuous current 0.5 A

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ENX 8 EASY INT

Encoder ∅8 mm, 1...1024 CPT

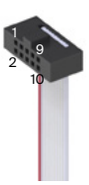
Integrated into motor

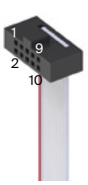
Key Data		EASY Incremental Differential	EASY Incremental, Commutation Signal
Number of channels		3	3
Max. counts per turn		1024	1024
Encoder length L	mm	0 (integrated into motor)	0 (integrated into motor)
Ambient temperature[2]	°C	-20...100 (-40...100)	-20...100 (-40...100)
Weight	g	<4	<4

Selection criteria	EASY Incremental Differential	EASY Incremental, Commutation Signal
Speed and rotation direction detection	■	■
Speed and position control	■	■
Compact and robust design	■	■
High resolution	■	■
Cost effective	■	■

■ suitable ▲ suitable to a limited extent ● not suitable

Specifications		EASY Incremental Differential	EASY Incremental, Commutation Signal
Supply voltage Vcc	V	5 ±0.5	5 ±0.5
Typical current draw	mA	17	17
Max. operating frequency	kHz	500	500
Max. Speed[5]	rpm	30 000 – 80 000	30 000 – 80 000
Connector[3]		10-pin 1.27 mm multipoint connector e.g. Samtec FFSD series Pin 1 Do not connect[4] (BiSS-C Data) Pin 2 V_{CC} 4.5...5.5 Pin 3 GND Pin 4 Do not connect[4] (BiSS-C CLK) Pin 5 Channel $\overline{A}$ Pin 6 Channel A Pin 7 Channel $\overline{B}$ Pin 8 Channel B Pin 9 Channel $\overline{I}$ Pin 10 Channel I Output signal: EIA-Standard RS 422 Output current per channel: ± 20 mA	10-pin 1.27 mm multipoint connector e.g. Samtec FFSD series Pin 1 Do not connect[4] (BiSS-C Data) Pin 2 V_{CC} 4.5...5.5 Pin 3 GND Pin 4 Do not connect[4] (BiSS-C CLK) Pin 5 H1 Pin 6 Channel A Pin 7 H2 Pin 8 Channel B Pin 9 H3 Pin 10 Channel I Output signal: CMOS compatible Output current per channel: + 20 mA Adapter Micromotor (Art.-No. 498157) required for all maxon controllers.

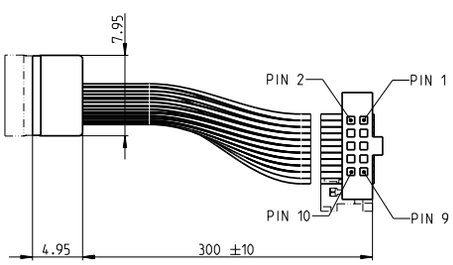




Configuration		EASY Incremental Differential	EASY Incremental, Commutation Signal
Counts per turn[1]		1...128, 256, 512, 1024	1...128, 256, 512, 1024
Cable length	mm	50, 100, 150, 200, 250, 300	50, 100, 150, 200, 250, 300
Cable insulation[2]		PVC/PO/FEP	PVC/PO/FEP
Alignment of cable outlet in relation to motor flange	°	axial	axial

maxon Modular System	Page
maxon EC motor	
ECX SPEED 8 M	175–176

Dimensions Standard Version M 3:4



Notes

[1] maxon controllers require a resolution of at least 16 counts per turn and commutation signals.
[2] For PVC-cable (-20...100°C)
For PO- and FEP cable (-40...100°C)
[3] H1, index and angle zero are aligned with angle commutation zero (see p. 46).
[4] Applying voltage to these pins may destroy the encoder.
[5] The max. possible speed depends on the selected counts per turn.

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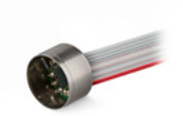
ENX 8 EASY INT Absolute

Encoder ∅8 mm, 4096 steps, Single Turn

Integrated into motor

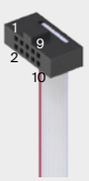


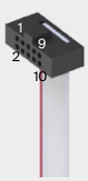
Key Data		EASY Absolute	EASY Absolute, Commutation Signal
Steps per turn		4096	4096
Resolution (bit single turn)		12	12
Encoder length L	mm	0 (integrated into motor)	0 (integrated into motor)
Ambient temperature[1]	°C	-20...100 (-40...100)	-20...100 (-40...100)
Weight	g	<4	<4

Selection criteria	EASY Absolute	EASY Absolute, Commutation Signal
Speed and rotation direction detection	■	■
Speed and position control	■	■
Compact and robust design	■	■
High resolution	■	■
Cost effective	■	■

■ suitable ▲ suitable to a limited extent ● not suitable

Specifications		EASY Absolute	EASY Absolute, Commutation Signal
Supply voltage Vcc	V	5 ±0.5	5 ±0.5
Typical current draw	mA	17	17
Max. operating frequency	kHz	80 000	80 000
Connector[2]		10-pin 1.27 mm multipoint connector e.g. Samtec FFSD series Pin 1 Data Pin 2 V_{cc} 4.5...5.5 Pin 3 GND Pin 4 CLK Pin 5 Do not connect[3] ($\overline{A}$) Pin 6 Do not connect[3] (A) Pin 7 Do not connect[3] ($\overline{B}$) Pin 8 Do not connect[3] (B) Pin 9 Do not connect[3] ($\overline{I}$) Pin 10 Do not connect[3] (I) Output signal: CMOS compatible Output current per channel: + 20 mA Adapter EASY Absolute (Part number 488167) required for all maxon controllers.	10-pin 1.27 mm multipoint connector e.g. Samtec FFSD series Pin 1 Data Pin 2 V_{cc} 4.5...5.5 Pin 3 GND Pin 4 CLK Pin 5 H1 Pin 6 Do not connect[3] (A) Pin 7 H2 Pin 8 Do not connect[3] (B) Pin 9 H3 Pin 10 Do not connect[3] (I) Output signal: CMOS compatible Output current per channel: + 20 mA

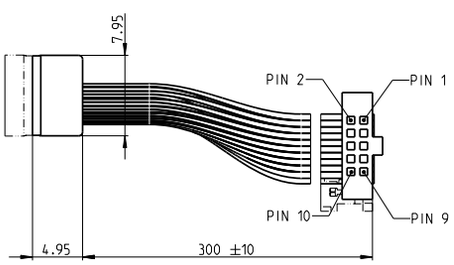




Configuration		EASY Absolute	EASY Absolute, Commutation Signal
Signal protocol		BiSS-C, SSI	BiSS-C, SSI
Cable length	mm	50, 100, 150, 200, 250, 300	50, 100, 150, 200, 250, 300
Cable insulation[1]		PVC/PO/FEP	PVC/PO/FEP
Alignment of cable outlet in relation to motor flange	°	axial	axial

maxon Modular System	Page
maxon EC motor	
ECX SPEED 8 M	175–176

Dimensions Standard Version M 3:4



Notes

[1] For PVC-cable (-20...100°C)
For PO- and FEP cable (-40...100°C)
[2] H1, index and angle zero are aligned with angle commutation zero (see p. 46).
[3] Applying voltage to these pins may destroy the encoder.

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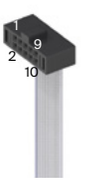
ENX 10 EASY / QUAD
Encoder ∅10 mm, 1...1024 CPT

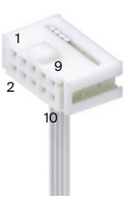
Key Data		EASY Incremental Differential	QUAD Incremental
Number of channels		3	2
Max. counts per turn		1024	1
Encoder length L[4]	mm	8.5	9.0
Ambient temperature	°C	-40 ... +100	-40 ... +100
Weight	g	<5	<5

Selection criteria	EASY Incremental Differential	QUAD Incremental
Speed and rotation direction detection	■	■
Speed and position control	■	▲
Compact and robust design	■	■
High resolution	■	●
Cost effective	■	■

■ suitable ▲ suitable to a limited extent ● not suitable

Specifications		EASY Incremental Differential	QUAD Incremental
Supply voltage Vcc	V	5 ±0.5	3.0 – 24
Typical current draw	mA	22	5.5
Max. operating frequency	kHz	500	2
Max. Speed	rpm	30000	30000
Connector		10-pin 1.27 mm multipoint connector e.g. Samtec FFSD series	10-pin 2.54 mm multipoint connector[3] (IEC/EN 60603-13 / DIN41651)
		Pin 1 Do not connect[1] (BiSS-C Data) Pin 2 V_{cc} Pin 3 GND Pin 4 Do not connect[1] (BiSS-C CLK) Pin 5 Channel $\overline{A}$ Pin 6 Channel A Pin 7 Channel $\overline{B}$ Pin 8 Channel B Pin 9 Channel $\overline{I}$ Pin 10 Channel I Output signal: EIA-Standard RS 422 Output current per channel: ± 20 mA	Pin 1 Not connected Pin 2 V_{cc} Pin 3 Channel A Pin 4 Channel B Pin 5 GND Pin 6 Not connected Pin 7 Not connected Pin 8 Not connected Pin 9 Not connected Pin 10 Not connected Output signal: TTL compatible Output current per channel: + 10 mA

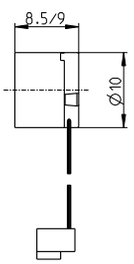




Configuration		EASY Incremental Differential	QUAD Incremental
Counts per turn[2]		1 ... 1024	1
Electrical connection		Flat band cable / flexible cable FFC[3]	Connector 6-pin, 10-pin
Cable length	mm	50, 100, 150, 200, 300, 500, 1000 / FFC[3]: 138 mm	50, 100, 150, 200, 300, 500, 1000
Alignment of cable outlet in relation to motor flange	°	15	15

maxon Modular System		Page
maxon DC motor		
DCX 10 S	EASY, QUAD	77
DCX 10 L	EASY, QUAD	78
DCX 12 S	EASY, QUAD	79
DCX 12 L	EASY, QUAD	80
DCX 14 L	EASY, QUAD	81–82
DCX 16 S	EASY, QUAD	83–84
DCX 16 L	EASY, QUAD	85–86
DCX 19 S	EASY, QUAD	87–88
DCX 22 S	EASY, QUAD	89–90
DCX 22 L	EASY, QUAD	91–92
DCX 26 L	EASY, QUAD	93–94
DCX 32 L	EASY, QUAD	95
DCX 35 L	EASY, QUAD	96
DC-max 16 S	EASY, QUAD	99–100
DC-max 22 S	EASY, QUAD	101–102
DC-max 26 S	QUAD	103–104

Dimensions Standard Configuration M 1:1



Notes

[1] Applying voltage to these pins can destroy the encoder.
[2] maxon controllers require a resolution of at least 16 counts per turn.
[3] FFC cable: 0.5 mm pitch, possible matching connector Molex 52745-1097; adapter 506579 required for maxon controllers.
[4] For attachment to DCX motors: plus 2-4 mm thick intermediate plate.

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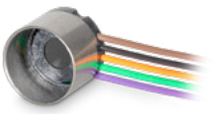
ENX 10 EASY XT
Encoder ∅10 mm, 1...1024 CPT



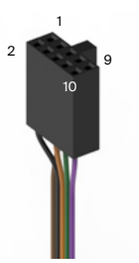
Key Data		EASY Incremental single-ended
Number of channels		3
Max. counts per turn		1024
Encoder length L[2]	mm	8.5
Ambient temperature	°C	-55 ... +125
Weight	g	<5

Selection criteria	EASY Incremental single-ended
Speed and rotation direction detection	■
Speed and position control	■
Compact and robust design	■
High resolution	■
Cost effective	▲

■ suitable ▲ suitable to a limited extent ● not suitable

Specifications		EASY Incremental single-ended
Supply voltage Vcc	V	5 ±0.5
Typical current draw	mA	22
Max. operating frequency	kHz	1600
Max. Speed	rpm	30000
Connector		10-pin 2.54 mm multipoint connector (IEC/EN 60603-13 / DIN41651)

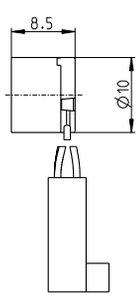
Pin 1 Not connected
Pin 2 V_{CC}
Pin 3 GND
Pin 4 Not connected
Pin 5 Not connected
Pin 6 Channel A
Pin 7 Not connected
Pin 8 Channel B
Pin 9 Not connected
Pin 10 Channel I
Output signal: TTL compatible
Output current per channel: + 10 mA



Configuration		EASY Incremental single-ended
Counts per turn[1]		1 ... 1024
Cable length	mm	300
Alignment of cable outlet in relation to motor flange	°	15

maxon Modular System	Page
maxon DC motor	
DCX 10 S	77
DCX 10 L	78
DCX 12 S	79
DCX 12 L	80
DCX 14 L	81–82
DCX 16 S	83–84
DCX 16 L	85–86
DCX 19 S	87–88
DCX 22 S	89–90
DCX 22 L	91–92
DCX 26 L	93–94
DCX 32 L	95
DCX 35 L	96

Dimensions Standard Configuration M 1:1



Notes

[1] maxon controllers require a resolution of at least 16 counts per turn.
[2] For attachment to DCX motors: plus 2-4 mm thick intermediate plate.

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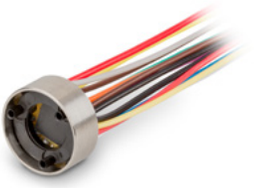
ENX 13 EASY INT

Encoder ∅13 mm, 1...1024 CPT / 4096 steps, Single Turn

Sterilizable, integrated into motor



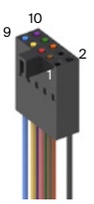
Key Data		EASY Incremental Differential	EASY Absolute
Number of channels		3	
Max. counts per turn		1024	
Steps per turn			4096
Resolution (bit single turn)			12
Encoder length L	mm	0 (integrated into motor)	0 (integrated into motor)
Ambient temperature	°C	-40...100	-40...100
Weight	g	<5	<5

Selection criteria	EASY Incremental Differential	EASY Absolute
Speed and rotation direction detection	■	■
Speed and position control	■	■
Compact and robust design	■	■
High resolution	■	■
Cost effective	■	■

■ suitable ▲ suitable to a limited extent ● not suitable

Specifications		EASY Incremental Differential	EASY Absolute
Supply voltage Vcc	V	5 ± 0.5	5 ± 0.5
Typical current draw	mA	22	22
Max. operating frequency	kHz	4000	
Max. Speed	rpm	200 000	200 000
Connector[2]		10-pin 2.54 mm multipoint connector (IEC/EN 60603-13 / DIN41651) cable AWG 28	without connector cable AWG 28

Pin 1 Not connected
Pin 2 (black) V_{CC}
Pin 3 (brown) GND
Pin 4 Not connected
Pin 5 (red) Channel $\overline{A}$
Pin 6 (orange) Channel A
Pin 7 (yellow) Channel $\overline{B}$
Pin 8 (green) Channel B
Pin 9 (blue) Channel $\overline{I}$
Pin 10 (violet) Channel I



Output signal: EIA-Standard RS 422
Output current per channel: ± 20 mA

green Data
black V_{CC}
brown GND
yellow CLK

Output signal: CMOS compatible
Output current per channel: + 20 mA

Configuration		EASY Incremental Differential	EASY Absolute
Counts per turn[1]		1...1024	
Signal protocol			BiSS-C, SSI
Cable length	mm	200, 500	200, 500
Electric connection			cable length/pin connection/connector

maxon Modular System	Page
maxon EC motor	
ECX SPEED 13 M	177–180
ECX SPEED 13 L	181–184

Sterilization information

135°C SS

Typically 1000 autoclave cycles

Sterilization with steam

Temperature	+134 ± 4°C
Compression pressure up to	2.3 bar
Rel. humidity	100%
Cycle length	18 minutes

The connector is not sterilizable and needs to be removed first.

Notes

[1] maxon controllers require a resolution of at least 16 counts per turn and commutation signals.
[2] H1, index and angle zero are aligned with angle commutation zero (see p. 46).

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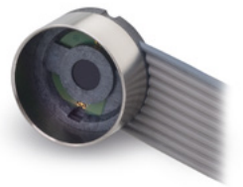
ENX 16 EASY
Encoder ∅16 mm, 1...1024 CPT

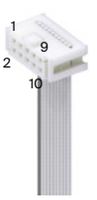


Key Data		EASY Incremental Differential
Number of channels		3
Max. counts per turn		1024
Encoder length L[2]	mm	8.5
Ambient temperature	°C	-40 ... +100
Weight	g	7

Selection criteria	EASY Incremental Differential
Speed and rotation direction detection	■
Speed and position control	■
Compact and robust design	■
High resolution	■
Cost effective	■

■ suitable ▲ suitable to a limited extent ● not suitable

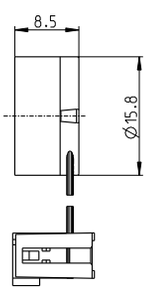
Specifications		EASY Incremental Differential
Supply voltage Vcc	V	5 ±0.5
Typical current draw	mA	22
Max. operating frequency	kHz	500
Max. Speed	rpm	30000
Connector		10-pin 2.54 mm multipoint connector (IEC/EN 60603-13 / DIN41651) Pin 1 Not connected Pin 2 V_{CC} Pin 3 GND Pin 4 Not connected Pin 5 Channel $\overline{A}$ Pin 6 Channel A Pin 7 Channel $\overline{B}$ Pin 8 Channel B Pin 9 Channel $\overline{I}$ Pin 10 Channel I Output signal: EIA-Standard RS 422 Output current per channel: ± 20 mA



Configuration		EASY Incremental Differential
Counts per turn[1]		1 ... 1024
Cable length	mm	50, 100, 150, 200, 300, 500, 1000
Alignment of cable outlet in relation to motor flange	°	15

maxon Modular System	Page
maxon DC motor	
DCX 16 S	83–84
DCX 16 L	85–86
DCX 19 S	87–88
DCX 22 S	89–90
DCX 22 L	91–92
DCX 26 L	93–94
DCX 32 L	95
DCX 35 L	96
DC-max 26 S	103–104
Also available in combination with BLDC motors (see pages 449–450)	

Dimensions Standard Version M 3:4



Notes

[1] maxon controllers require a resolution of at least 16 counts per turn.
[2] For attachment to DCX motors: plus 2-4 mm thick intermediate plate.

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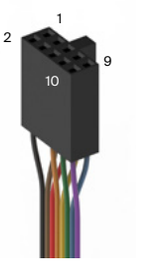
ENX 16 EASY XT
Encoder ∅16 mm, 1...1024 CPT

Key Data		EASY Incremental Differential
Number of channels		3
Max. counts per turn		1024
Encoder length L[2]	mm	8.5
Ambient temperature	°C	-55 ... +125
Weight	g	7

Selection criteria	EASY Incremental Differential
Speed and rotation direction detection	■
Speed and position control	■
Compact and robust design	■
High resolution	■
Cost effective	▲

■ suitable ▲ suitable to a limited extent ● not suitable

Specifications		EASY Incremental Differential
Supply voltage Vcc	V	5 ±0.5
Typical current draw	mA	22
Max. operating frequency	kHz	1600
Max. Speed	rpm	30000
Connector		10-pin 2.54 mm multipoint connector (IEC/EN 60603-13 / DIN41651) Pin 1 Not connected Pin 2 V_{cc} Pin 3 GND Pin 4 Not connected Pin 5 Channel $\bar{A}$ Pin 6 Channel A Pin 7 Channel $\bar{B}$ Pin 8 Channel B Pin 9 Channel $\bar{I}$ Pin 10 Channel I Output signal: EIA-Standard RS 422 Output current per channel: ± 20 mA

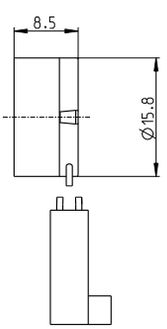


Configuration		EASY Incremental Differential
Counts per turn[1]		1 ... 1024
Cable length	mm	500, 1000, 1500
Alignment of cable outlet in relation to motor flange	°	15

maxon Modular System	Page
maxon DC motor	
DCX 16 S	83–84
DCX 16 L	85–86
DCX 19 S	87–88
DCX 22 S	89–90
DCX 22 L	91–92
DCX 26 L	93–94
DCX 32 L	95
DCX 35 L	96

Also available in combination with BLDC motors (see pages 451–452)

Dimensions Standard Version M 3:4



Notes

[1] maxon controllers require a resolution of at least 16 counts per turn.
[2] For attachment to DCX motors: plus 2-4 mm thick intermediate plate.

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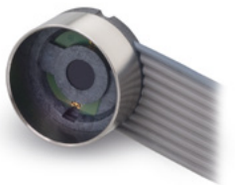
ENX 16 EASY Absolute

Encoder ∅16 mm, 4096 steps, Single Turn

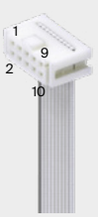


Key Data		EASY Absolute
Steps per turn		4096
Resolution (bit single turn)		12
Encoder length L[1]	mm	8.5
Ambient temperature	°C	-40 ... +100
Weight	g	7

Selection criteria	EASY Absolute
Speed and rotation direction detection	■
Speed and position control	■
Compact and robust design	■
High resolution	■
Cost effective	■

■ suitable ▲ suitable to a limited extent ● not suitable

Specifications		EASY Absolute
Supply voltage Vcc	V	5 ±0.5
Typical current draw	mA	17
Max. Speed	rpm	30000
Connector		10-pin 2.54 mm multipoint connector (IEC/EN 60603-13 / DIN41651) Pin 1 Data Pin 2 V_{CC} Pin 3 GND Pin 4 CLK Pin 5 Do not connect[2] ($\overline{A}$) Pin 6 Do not connect[2] (A) Pin 7 Do not connect[2] ($\overline{B}$) Pin 8 Do not connect[2] (B) Pin 9 Do not connect[2] ($\overline{I}$) Pin 10 Do not connect[2] (I) Output signal: CMOS compatible Output current per channel ± 20 mA

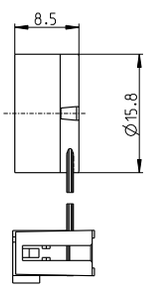


Configuration		EASY Absolute
Signal protocol		BiSS-C, SSI
Cable length	mm	50, 100, 150, 200, 300, 500, 1000
Alignment of cable outlet in relation to motor flange	°	15

maxon Modular System	Page
maxon DC motor	
DCX 16 S	83–84
DCX 16 L	85–86
DCX 19 S	87–88
DCX 22 S	89–90
DCX 22 L	91–92
DCX 26 L	93–94
DCX 32 L	95
DCX 35 L	96
DC-max 26 S	103–104

Also available in combination with BLDC motors
(see pages 453–454)

Dimensions Standard Version M 3:4



Notes

Adapter EASY Absolute (Part number 488167) required for all maxon controllers.

[1] For attachment to DCX motors: added 2-4 mm thick intermediate plate.

[2] Applying voltage to these pins may destroy the encoder.

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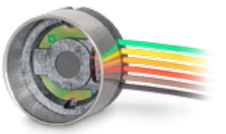
ENX 16 EASY Absolute XT

Encoder ∅16 mm, 4096 steps, Single Turn

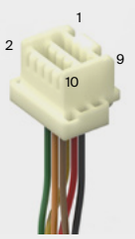


Key Data		EASY Absolute Differential
Steps per turn		4096
Resolution (bit single turn)		12
Encoder length L[1]	mm	9.0
Ambient temperature	°C	-55 ... +125
Weight	g	7

Selection criteria	EASY Absolute Differential
Speed and rotation direction detection	■
Speed and position control	■
Compact and robust design	■
High resolution	■
Cost effective	▲

■ suitable ▲ suitable to a limited extent ● not suitable

Specifications		EASY Absolute Differential
Supply voltage Vcc	V	5 ±0.25
Typical current draw	mA	22
Max. Speed	rpm	30 000
Connector		10-pin 1.5 mm multipoint connector Molex Clik-Mate (503154) Pin 1 Not connected Pin 2 Not connected Pin 3 Not connected Pin 4 Not connected Pin 5 CLK Pin 6 CLK\ Pin 7 Data Pin 8 Data\ Pin 9 GND Pin 10 V_{cc} Output signal: EIA-Standard RS 422 Output current per channel: ± 20 mA

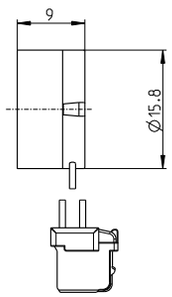


Configuration		EASY Absolute Differential
Signal protocol		BiSS-C, SSI
Cable length	mm	500, 1000
Alignment of cable outlet in relation to motor flange	°	15

maxon Modular System	Page
maxon DC motor	
DCX 16 S	83–84
DCX 16 L	85–86
DCX 19 S	87–88
DCX 22 S	89–90
DCX 22 L	91–92
DCX 26 L	93–94
DCX 32 L	95
DCX 35 L	96

Also available in combination with BLDC motors (see pages 455–456)

Dimensions Standard Version M 3:4



Notes

[1] For attachment to DCX motors: added 2-4 mm thick intermediate plate.

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ENX 16 EASY INT

Encoder ∅16 mm, 1...1024 CPT / 4096 steps, Single Turn

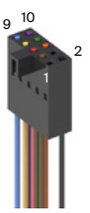
Sterilizable, integrated into motor

Key Data		EASY Incremental Differential	EASY Absolute
Number of channels		3	
Max. counts per turn		1024	
Steps per turn			4096
Resolution (bit single turn)			12
Encoder length L	mm	-1 (integrated into motor)	-1 (integrated into motor)
Ambient temperature	°C	-40...100	-40...100
Weight	g	<5	<5

Selection criteria	EASY Incremental Differential	EASY Absolute
Speed and rotation direction detection	■	■
Speed and position control	■	■
Compact and robust design	■	■
High resolution	■	■
Cost effective	■	■

■ suitable ▲ suitable to a limited extent ● not suitable

Specifications		EASY Incremental Differential[3]	EASY Absolute
Supply voltage Vcc	V	5 ± 0.5	5 ± 0.5
Typical current draw	mA	22	22
Max. operating frequency	kHz	4000	
Max. Speed	rpm	200 000	200 000
Connector[2]		10-pin 2.54 mm multipoint connector (IEC/EN 60603-13 / DIN41651) cable AWG 28 Pin 1 Not connected Pin 2 (black) V_{CC} Pin 3 (brown) GND Pin 4 Not connected Pin 5 (red) Channel $\overline{A}$ Pin 6 (orange) Channel A Pin 7 (yellow) Channel $\overline{B}$ Pin 8 (green) Channel B Pin 9 (blue) Channel $\overline{I}$ Pin 10 (violet) Channel I Output signal: EIA-Standard RS 422 Output current per channel: ± 20 mA	without connector cable AWG 28 green Data black V_{CC} brown GND yellow CLK Output signal: CMOS compatible Output current per channel + 20 mA



Configuration		EASY Incremental Differential	EASY Absolute
Counts per turn[1]		1...1024	
Signalprotokoll			BiSS-C, SSI
Cable length	mm	200, 500	200, 500
Electric connection			cable length/pin connection/connector

maxon Modular System	Page
maxon EC motor	
ECX SPEED 16 M	185–188
ECX SPEED 16 L	189–192

Sterilization information

135°C

Typically 1000 autoclave cycles

Sterilization with steam

Temperature	+134 ± 4°C
Compression pressure up to	2.3 bar
Rel. humidity	100%
Cycle length	18 minutes

The connector is not sterilizable and needs to be removed first.

Notes

[1] maxon controllers require a resolution of at least 16 counts per turn and commutation signals.
[2] H1, index and angle zero are aligned with angle commutation zero (see p. 46).

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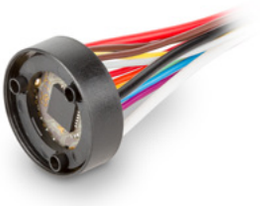
ENX 19 EASY INT

Encoder ∅19 mm, 1...1024 CPT / 4096 steps, Single Turn

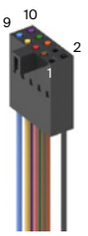
Sterilizable, integrated into motor



Key Data		EASY Incremental Differential	EASY Absolute
Number of channels		3	
Max. counts per turn		1024	
Steps per turn			4096
Resolution (bit single turn)			12
Encoder length L	mm	-1.4 (integrated into motor)	-1.4 (integrated into motor)
Ambient temperature	°C	-40...100	-40...100
Weight	g	<5	<5

Selection criteria	EASY Incremental Differential	EASY Absolute
Speed and rotation direction detection	■	■
Speed and position control	■	■
Compact and robust design	■	■
High resolution	■	■
Cost effective	■	■

■ suitable ▲ suitable to a limited extent ● not suitable

Specifications		EASY Incremental Differential[3]	EASY Absolute
Supply voltage Vcc	V	5 ± 0.5	5 ± 0.5
Typical current draw	mA	22	22
Max. operating frequency	kHz	4000	
Max. Speed	rpm	200 000	200 000
Connector[2]		10-pin 2.54 mm multipoint connector (IEC/EN 60603-13 / DIN41651) cable AWG 26 Pin 1 Not connected Pin 2 (black) V_{cc} Pin 3 (brown) GND Pin 4 Not connected Pin 5 (red) Channel $\overline{A}$ Pin 6 (orange) Channel A Pin 7 (yellow) Channel $\overline{B}$ Pin 8 (green) Channel B Pin 9 (blue) Channel $\overline{I}$ Pin 10 (violet) Channel I	without connector cable AWG 26 green Data black V_{cc} brown GND yellow CLK
			
		Output signal: EIA-Standard RS 422 Output current per channel: ± 20 mA	Output signal: CMOS compatible Output current per channel + 20 mA

Configuration		EASY Incremental Differential	EASY Absolute
Counts per turn[1]		1...1024	
Signalprotokoll			BiSS-C, SSI
Cable length	mm	200, 500	200, 500
Electric connection			cable length/pin connection/connector

maxon Modular System	Page
maxon EC motor	
ECX SPEED 19 M	193–196
ECX SPEED 19 L	197–200

Sterilization information

135°C SSS

Typically 1000 autoclave cycles

Sterilization with steam

Temperature	+134 ± 4°C
Compression pressure up to	2.3 bar
Rel. humidity	100%
Cycle length	18 minutes

The connector is not sterilizable and needs to be removed first.

Notes

[1] maxon controllers require a resolution of at least 16 counts per turn and commutation signals.

[2] H1, index and angle zero are aligned with angle commutation zero (see p. 46).

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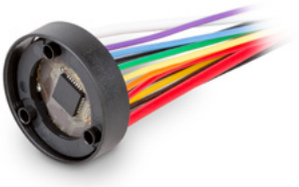
ENX 22 EASY INT

Encoder ∅22 mm, 1...1024 CPT / 4096 steps, Single Turn

Sterilizable, integrated into motor

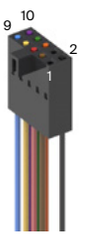


Key Data		EASY Incremental Differential	EASY Absolute
Number of channels		3	
Max. counts per turn		1024	
Steps per turn			4096
Resolution (bit single turn)			12
Encoder length L	mm	-1.5 (integrated into motor)	-1.5 (integrated into motor)
Ambient temperature	°C	-40...100	-40...100
Weight	g	<5	<5

Selection criteria	EASY Incremental Differential	EASY Absolute
Speed and rotation direction detection	■	■
Speed and position control	■	■
Compact and robust design	■	■
High resolution	■	■
Cost effective	■	■

■ suitable ▲ suitable to a limited extent ● not suitable

Specifications		EASY Incremental Differential[3]	EASY Absolute
Supply voltage Vcc	V	5 ± 0.5	5 ± 0.5
Typical current draw	mA	22	22
Max. operating frequency	kHz	4000	
Max. Speed	rpm	200 000	200 000
Connector[2]		10-pin 2.54 mm multipoint connector (IEC/EN 60603-13 / DIN41651) cable AWG 26 Pin 1 Not connected Pin 2 (black) V_{CC} Pin 3 (brown) GND Pin 4 Not connected Pin 5 (red) Channel $\overline{A}$ Pin 6 (orange) Channel A Pin 7 (yellow) Channel $\overline{B}$ Pin 8 (green) Channel B Pin 9 (blue) Channel $\overline{I}$ Pin 10 (violet) Channel I Output signal: EIA-Standard RS 422 Output current per channel: ± 20 mA	without connector cable AWG 26 green Data black V_{CC} brown GND yellow CLK Output signal: CMOS compatible Output current per channel + 20 mA



Configuration		EASY Incremental Differential	EASY Absolute
Counts per turn[1]		1...1024	
Signalprotokoll			BiSS-C, SSI
Cable length	mm	200, 500	200, 500
Electric connection			cable length/pin connection/connector

maxon Modular System	Page
maxon EC motor	
ECX SPEED 22 M	201–204
ECX SPEED 22 L	205–208
ECX TORQUE 22 M	215
ECX TORQUE 22 L	216
ECX TORQUE 22 XL	217

Sterilization information

135°C

Typically 1000 autoclave cycles

Sterilization with steam

Temperature	+134 ± 4°C
Compression pressure up to	2.3 bar
Rel. humidity	100%
Cycle length	18 minutes

The connector is not sterilizable and needs to be removed first.

Notes

[1] maxon controllers require a resolution of at least 16 counts per turn and commutation signals.
[2] H1, index and angle zero are aligned with angle commutation zero (see p. 46).

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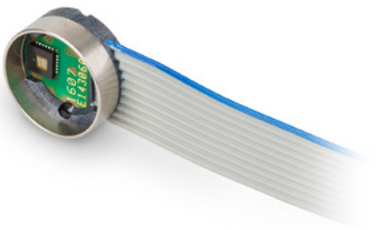
ENX 16 RIO
Encoder ∅16 mm, 512 ... 65536 CPT

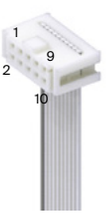


Key Data		RIO Incremental, optical
Number of channels		3
Max. counts per turn		65536
Encoder length L[1]	mm	7.0
Ambient temperature	°C	-40 ... +100
Weight	g	15

Selection criteria	RIO Incremental, optical
Speed and rotation direction detection	■
Speed and position control	■
Compact and robust design	■
High resolution	■
Cost effective	■

■ suitable ▲ suitable to a limited extent ● not suitable

Specifications		RIO Incremental, optical
Supply voltage Vcc	V	5 ± 10%
Typical current draw	mA	50
Max. operating frequency	kHz	3125
Max. Speed	min^{-1}	40 000
Connection		10-pin 2.54 mm multipoint connector (IEC/EN 60603-13 / DIN41651) Pin 1 Not connected Pin 2 V_{CC} Pin 3 GND Pin 4 Not connected Pin 5 Channel $\overline{A}$ Pin 6 Channel A Pin 7 Channel $\overline{B}$ Pin 8 Channel B Pin 9 Channel $\overline{I}$ Pin 10 Channel I Output signal: EIA-Standard RS 422 Output current per channel: ± 20 mA

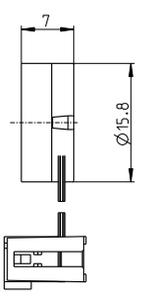


Configuration		RIO Incremental, optical
Counts per turn		512... 65536 (in steps of 256)
Cable length	mm	50, 100, 150, 200, 300, 500, 1000
Alignment of cable outlet in relation to motor flange	°	15

maxon Modular System	Seite
maxon DC motor	
DCX 16 S	83–84
DCX 16 L	85–86
DCX 19 S	87–88
DCX 22 S	89–90
DCX 22 L	91–92
DCX 26 L	93–94
DCX 32 L	95
DCX 35 L	96

Also available in combination with BLDC motors
(see pages 466–467)

Dimensions Standard Version



Notes

[1] For attachment to DCX motors: added 2-4 mm thick intermediate plate.

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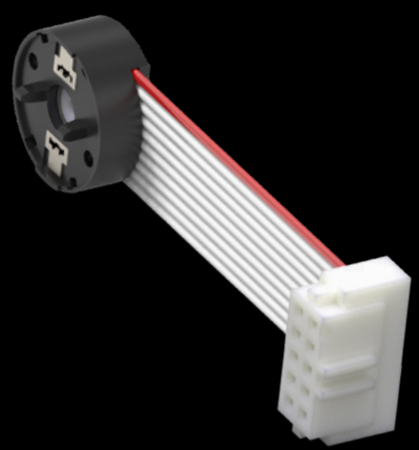
For your personal notes

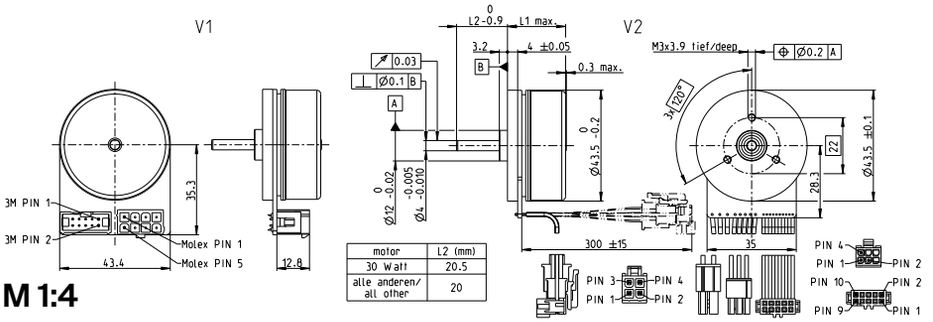
maxon sensor



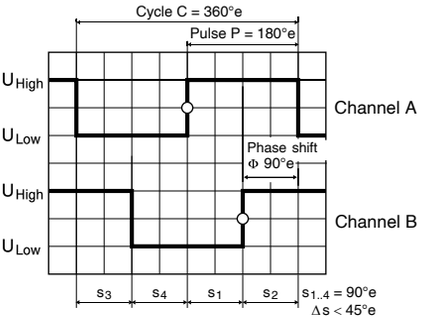
Robust encoders, DC tachometers, and resolvers with high accuracy and high signal resolution. Due to resonance, these are mainly mounted on motors with a continuous shaft. The assembly requires adjustment to the motors and may only be done in the delivery plant.

Encoder MILE 256–2048 CPT, 2 Channels, with Line Driver

Integrated into motor



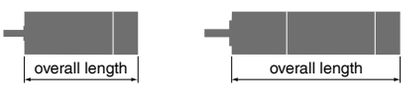
M 1:4



Direction of rotation cw (definition cw p. 68)

Stock program
Standard program
Special program (on request)

	Article Numbers			
V1 with connector	673024	673025	673026	673027
V2 with cable and connector	673028	673029	673030	673031
Type				
Counts per turn	256	512	1024	2048
Number of channels	2	2	2	2
Max. operating frequency (kHz)	1000	1000	1000	1000
Max. speed (rpm)	10 000	10 000	10 000	10 000



maxon Modular System						Overall length [mm] / ● see Gearhead			
+ Motor	Page	**+ Gearhead**	Page	**+ Brake**	Page				
EC 45 flat, 30 W, A	285					18.6	18.6	18.6	18.6
EC 45 flat, 30 W, A	285	GP 42, 3 - 15 Nm	398			●	●	●	●
EC 45 flat, 30 W, A	285	GS 45, 0.5 - 2.0 Nm	400			●	●	●	●
EC 45 flat, 50 W, A	286					22.6	22.6	22.6	22.6
EC 45 flat, 50 W, A	286	GP 42, 3 - 15 Nm	398			●	●	●	●
EC 45 flat, 50 W, A	286	GS 45, 0.5 - 2.0 Nm	400			●	●	●	●
EC 45 flat, 70 W, A	289					28.4	28.4	28.4	28.4
EC 45 flat, 70 W, A	289	GP 42, 3 - 15 Nm	398			●	●	●	●
EC 45 flat, 70 W, A	289	GS 45, 0.5 - 2.0 Nm	400			●	●	●	●
EC 45 flat, 60 W, A	287					22.8	22.8	22.8	22.8
EC 45 flat, 60 W, A	287	GP 42, 3 - 15 Nm	398			●	●	●	●
EC 45 flat, 60 W, A	287	GS 45, 0.5 - 2.0 Nm	400			●	●	●	●
EC 45 flat, 90 W, A	288					28.8	28.8	28.8	28.8
EC 45 flat, 90 W, A	288	GP 42, 3 - 15 Nm	398			●	●	●	●
EC 45 flat, 90 W, A	288	GS 45, 0.5 - 2.0 Nm	400			●	●	●	●
EC 45 flat, 80 W, A	290					27.8	27.8	27.8	27.8
EC 45 flat, 80 W, A	290	GP 42, 3 - 15 Nm	398			●	●	●	●
EC 45 flat, 80 W, A	290	GS 45, 0.5 - 2.0 Nm	400			●	●	●	●
EC 45 flat, 120 W, A	291					33.8	33.8	33.8	33.8
EC 45 flat, 120 W, A	291	GP 42, 3 - 15 Nm	398			●	●	●	●
EC 45 flat, 120 W, A	291	GS 45, 0.5 - 2.0 Nm	400			●	●	●	●

Technical Data

Supply voltage V_{CC}	5 B ± 10%
Typical current draw	15 mA
Output signal	CMOS compatible
State length s_n 90°e (1000 rpm)	45...135°e
Signal rise time (typically, at C_L = 25 pF, R_L = 1 kΩ, 25 °C)	100 ns
Signal fall time (typically, at C_L = 25 pF, R_L = 1 kΩ, 25 °C)	100 ns
Operating temperature range	-40...+100 °C
Moment of inertia of code wheel	≤ 3.5 gcm²
Output current per channel	max. 4 mA
Open collector output of the Hall sensors with integrated pull-up resistor	10 kΩ ± 20%
Wiring diagram for Hall sensors see p. 49	

Additional information can be found under 'Downloads' in the maxon online shop.

Pin Allocation

Connection V1
Motor + Sensors
Pin 1 Hall sensor 1
Pin 2 Hall sensor 2
Pin 3 V_{Hall} 4.5...18 VDC
Pin 4 Motor winding 3
Pin 5 Hall sensor 3
Pin 6 GND
Pin 7 Motor winding 1
Pin 8 Motor winding 2

Encoder
Pin 1 N.C.
Pin 2 V_{CC}
Pin 3 GND
Pin 4 N.C.
Pin 5 Channel $\overline{A}$
Pin 6 Channel A
Pin 7 Channel $\overline{B}$
Pin 8 Channel B
Pin 9 Do not connect
Pin 10 Do not connect

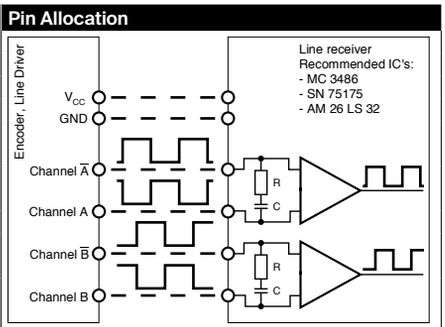
Pin type:
39-28-1083 Molex
DIN 41651/EN 60603-13

Connection V2
Sensors (AWG 24)
Pin 1 Hall sensor 1
Pin 2 Hall sensor 2
Pin 3 Hall sensor 3
Pin 4 GND
Pin 5 V_{Hall} 4.5...18 VDC
Pin 6 N.C.
Motor (AWG 24)
Pin 1 Motor winding 1
Pin 2 Motor winding 2
Pin 3 Motor winding 3
Pin 4 Not connected

Encoder (AWG 28)
Pin 1 N.C.
Pin 2 V_{CC}
Pin 3 GND
Pin 4 N.C.
Pin 5 Channel $\overline{A}$
Pin 6 Channel A
Pin 7 Channel $\overline{B}$
Pin 8 Channel B
Pin 9 Do not connect
Pin 10 Do not connect

43025-600 Molex
39-01-2040 Molex
DIN 41651/EN 60603-13

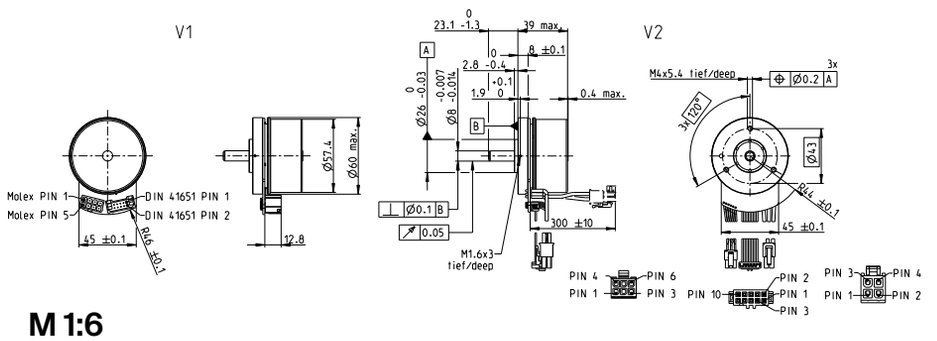
Pin Allocation



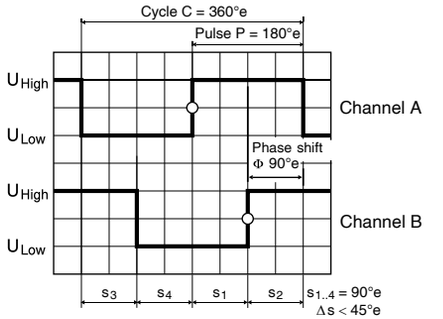
Opt. terminal resistance R = typical 120 Ω
Capacitor C ≥ 0.1 nF per m line length

Encoder MILE 512–4096 CPT, 2 Channels, with Line Driver

Integrated into motor



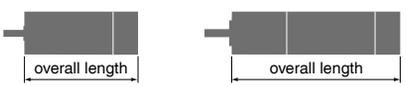
M 1:6



Direction of rotation cw (definition cw p. 68)

Stock program
Standard program
Special program (on request)

	Part Numbers			
V1 with connector	651156	651163	651166	**651168**
V2 with cable and connector	421985	421986	421987	421988
Type				
Counts per turn	512	1024	2048	4096
Number of channels	2	2	2	2
Max. operating frequency (kHz)	1000	1000	1000	1000
Max. speed (rpm)	6000	6000	6000	6000



maxon Modular System									
+ Motor	Page	**+ Gearhead**	Page	**+ Brake**	Page	**Overall length [mm] / ● see Gearhead**			
EC 60 flat, 100 W	294					39.0	39.0	39.0	39.0
EC 60 flat, 100 W	294	GP 52, 4 - 30 Nm	402			●	●	●	●
EC 60 flat, 150 W	295					39.0	39.0	39.0	39.0
EC 60 flat, 150 W	295	GP 52, 4 - 30 Nm	402			●	●	●	●
EC 60 flat, 200 W	296					46.5	46.5	46.5	46.5
EC 60 flat, 200 W	296	GP 52, 4 - 30 Nm	402			●	●	●	●

Technical Data

Supply voltage V_{CC}	5 V ± 10%
Typical current draw	15 mA
Output signal	CMOS compatible
State length s_n (1000 rpm)	90°e ± <45°e
Signal rise time (typically, at C_L = 25 pF, R_L = 1 kΩ, 25 °C)	100 ns
Signal fall time (typically, at C_L = 25 pF, R_L = 1 kΩ, 25 °C)	100 ns
Operating temperature range	-40...+100 °C
Moment of inertia of code wheel	≤ 13 gcm²
Output current per channel	max. 4 mA
Open collector output of the Hall sensors with integrated pull-up resistor	10 kΩ ± 20%
Wiring diagram for Hall sensors see p. 49	

Additional information can be found under 'Downloads' in the maxon online shop.

Pin Allocation

Connection V1
Motor + Sensors
Pin 1 Hall sensor 1
Pin 2 Hall sensor 2
Pin 3 V_{Hall} 4.5...18 VDC
Pin 4 Motor winding 3
Pin 5 Hall sensor 3
Pin 6 GND
Pin 7 Motor winding 1
Pin 8 Motor winding 2

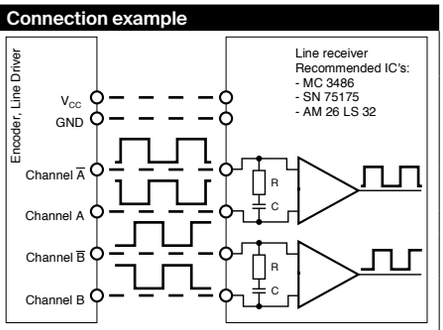
Encoder
Pin 1 N.C.
Pin 2 V_{CC}
Pin 3 GND
Pin 4 N.C.
Pin 5 Channel $\overline{A}$
Pin 6 Channel A
Pin 7 Channel $\overline{B}$
Pin 8 Channel B
Pin 9 Do not connect
Pin 10 Do not connect

Pin type:
46015-0806 Molex
DIN 41651/EN 60603-13

Connection V2
Sensors (AWG 24)
Pin 1 Hall sensor 1
Pin 2 Hall sensor 2
Pin 3 Hall sensor 3
Pin 4 GND
Pin 5 V_{Hall} 4.5...18 VDC
Pin 6 N.C.
Motor (AWG 16)
Pin 1 Motor winding 1
Pin 2 Motor winding 2
Pin 3 Motor winding 3
Pin 4 Not connected
Encoder (AWG 28)
Pin 1 N.C.
Pin 2 V_{CC}
Pin 3 GND
Pin 4 N.C.
Pin 5 Channel $\overline{A}$
Pin 6 Channel A
Pin 7 Channel $\overline{B}$
Pin 8 Channel B
Pin 9 Do not connect
Pin 10 Do not connect

43025-600 Molex
39-01-2040 Molex
DIN 41651/EN 60603-13

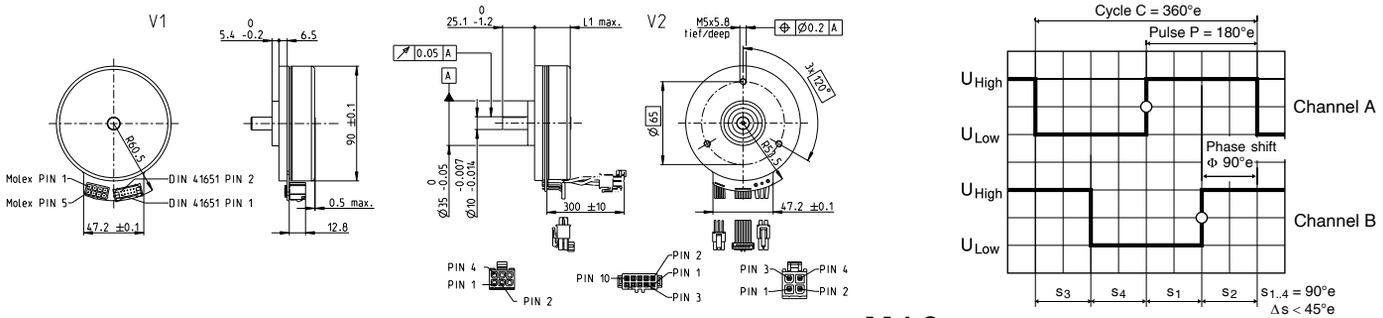
Connection example



Opt. terminal resistance R = typical 120 Ω
Capacitor C ≥ 0.1 nF per m line length

Encoder MILE 512–6400 CPT, 2 Channels, with Line Driver

Integrated into motor

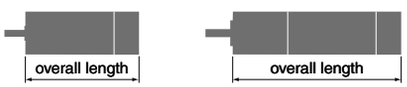


M 1:6

Direction of rotation cw (definition cw p. 68)

Stock program
Standard program
Special program (on request)

	Part Numbers							
V1 with connector	621796	621789	621795	621790	621794	621791	621793	621792
V2 with cable and connector	607517	607510	607516	607511	607515	607512	607514	607513
Type								
Counts per turn	512	800	1024	1600	2048	3200	4096	6400
Number of channels	2	2	2	2	2	2	2	2
Max. operating frequency (kHz)	1000	1000	1000	1000	1000	1000	1000	1000
Max. speed (rpm)	5000	5000	5000	5000	5000	5000	5000	5000



maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead							
EC 90 flat, 160 W	297					28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0
EC 90 flat, 220 W	298					28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0
EC 90 flat, 360 W	299					40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5
EC 90 flat, 260 W	300					40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5
EC 90 flat, 400 W	301					40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5
EC 90 flat, 600 W	302					53.0	53.0	53.0	53.0	53.0	53.0	53.0	53.0

Technical Data

Supply voltage V_{CC}	5 V ± 10%
Typical current draw	15 mA
Output signal driver used:	CMOS compatible
State length s_n (500 rpm)	90°e ± <45°e
Signal rise and fall times (typically, at C_L = 25 pF, R_L = 1 kΩ, 25 °C)	100 ns
Operating temperature range	-40...+100 °C
Moment of inertia of code wheel	≤ 65 gcm²
Output current per channel	max. 4 mA
Open collector output of the Hall sensors with integrated pull-up resistor	10 kΩ ± 20%
Wiring diagram for Hall sensors see p. 49	

Additional information can be found under 'Downloads' in the maxon online shop.

Pin Allocation

Connection V1
Motor + Sensors
Pin 1 Hall sensor 1
Pin 2 Hall sensor 2
Pin 3 V_{Hall} 3.5...18 VDC
Pin 4 Motor winding 3
Pin 5 Hall sensor 3
Pin 6 GND
Pin 7 Motor winding 1
Pin 8 Motor winding 2

Encoder
Pin 1 N.C.
Pin 2 V_{CC}
Pin 3 GND
Pin 4 N.C.
Pin 5 Channel $\overline{A}$
Pin 6 Channel A
Pin 7 Channel $\overline{B}$
Pin 8 Channel B
Pin 9 Do not connect
Pin 10 Do not connect

Pin type:
46015-0806 Molex
DIN 41651/EN 60603-13

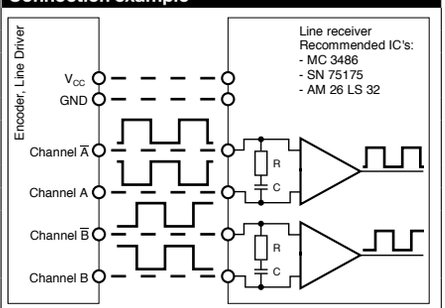
Connection V2
Sensors (AWG24)
Pin1 Hall sensor 1
Pin 2 Hall sensor 2
Pin 3 Hall sensor 3
Pin 4 GND
Pin 5 V_{Hall} 3.5...18 VDC
Pin 6 NTC*
Motor (AWG 16)
Pin 1 Motor winding 1
Pin 2 Motor winding 2
Pin 3 Motor winding 3
Pin 4 Not connected

Encoder (AWG 28)
Pin 1 N.C.
Pin 2 V_{CC}
Pin 3 GND
Pin 4 N.C.
Pin 5 Channel $\overline{A}$
Pin 6 Channel A
Pin 7 Channel $\overline{B}$
Pin 8 Channel B
Pin 9 Do not connect
Pin 10 Do not connect

43025-0600 Molex
39-01-2040 Molex
DIN 41651/EN 60603-13

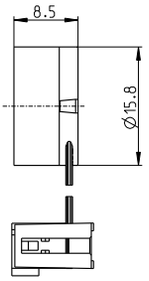
*NTC resistance 25°C: 5 kΩ ± 1%, beta (25-85°C): 3490K

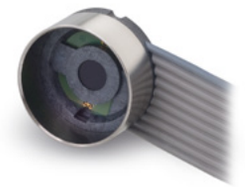
Connection example

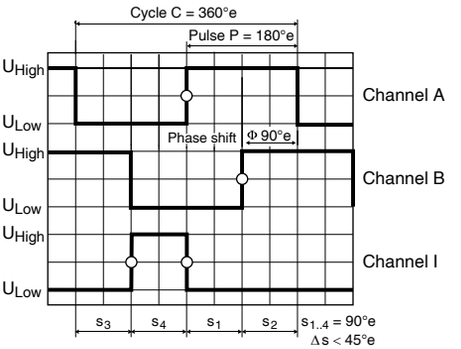


Opt. terminal resistance R = typical 120 Ω
Capacitor C ≥ 0.1 nF per m line length

Encoder 16 EASY 128–1024 CPT, 3 Channels, with Line Driver RS 422



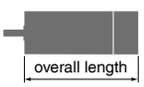


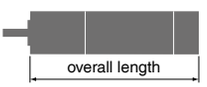


Direction of rotation cw (definition cw p. 68)

Stock program
Standard program
Special program (on request)

Part Numbers	499356	499357	499358	499359	499360	499361
Type (provisional)						
Counts per turn	128	256	500	512	1000	1024
Number of channels	3	3	3	3	3	3
Max. operating frequency (kHz)	1600	1600	1600	1600	1600	1600
Max. speed (rpm)	30000	30000	30000	30000	30000	30000
Phase shift Φ (°e)	90 ± 45	90 ± 45	90 ± 60	90 ± 45	90 ± 80	90 ± 70
Index pulse width (°e)	90 ± 45	90 ± 45	90 ± 60	90 ± 45	90 ± 80	90 ± 70





maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / • see Gearhead					
EC-4pole 22, 90 W	247					60.8	60.8	60.8	60.8	60.8	60.8
EC-4pole 22, 90 W	247	GP 22, 2.0 - 3.4 Nm	378			•	•	•	•	•	•
EC-4pole 22, 90 W	247	GP 32, 1.0 - 6.0 Nm	388			•	•	•	•	•	•
EC-4pole 22, 90 W	247	GP 32 S	416-421			•	•	•	•	•	•
EC-4pole 22, 120 W	248					78.2	78.2	78.2	78.2	78.2	78.2
EC-4pole 22, 120 W	248	GP 22, 2.0 - 3.4 Nm	378			•	•	•	•	•	•
EC-4pole 22, 120 W	248	GP 32, 1.0 - 6.0 Nm	388			•	•	•	•	•	•
EC-4pole 22, 120 W	248	GP 32 S	416-421			•	•	•	•	•	•
EC-4pole 30, 100 W	249					60.9	60.9	60.9	60.9	60.9	60.9
EC-4pole 30, 100 W	249	GP 32, 4.0 - 8.0 Nm	391			•	•	•	•	•	•
EC-4pole 30, 100 W	249	GP 42, 3.0 - 15.0 Nm	397			•	•	•	•	•	•
EC-4pole 30, 100 W	249			AB 20	516	97.3	97.3	97.3	97.3	97.3	97.3
EC-4pole 30, 100 W	249	GP 32, 4.0 - 8.0 Nm	391	AB 20	516	•	•	•	•	•	•
EC-4pole 30, 100 W	249	GP 42, 3.0 - 15.0 Nm	397	AB 20	516	•	•	•	•	•	•
EC-4pole 30, 200 W	251					77.9	77.9	77.9	77.9	77.9	77.9
EC-4pole 30, 200 W	251	GP 32, 4.0 - 8.0 Nm	391			•	•	•	•	•	•
EC-4pole 30, 200 W	251	GP 42, 3.0 - 15.0 Nm	397			•	•	•	•	•	•
EC-4pole 30, 200 W	251			AB 20	516	114.3	114.3	114.3	114.3	114.3	114.3
EC-4pole 30, 200 W	251	GP 32, 4.0 - 8.0 Nm	391	AB 20	516	•	•	•	•	•	•
EC-4pole 30, 200 W	251	GP 42, 3.0 - 15.0 Nm	397	AB 20	516	•	•	•	•	•	•
EC-i 30, 30 W	258					53.7	53.7	53.7	53.7	53.7	53.7
EC-i 30, 30 W	258	GP 32, 1.0 - 6.0 Nm	388			•	•	•	•	•	•
EC-i 30, 30 W	258	GP 32 S	416-421			•	•	•	•	•	•
EC-i 30, 45 W	259					53.7	53.7	53.7	53.7	53.7	53.7
EC-i 30, 45 W	259	GP 32, 1.0 - 6.0 Nm	388			•	•	•	•	•	•
EC-i 30, 45 W	259	GP 32 S	416-421			•	•	•	•	•	•

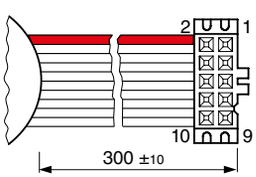
Technical Data

Supply voltage V_{CC}	5 V ± 10%
Typical current draw	22 mA
Output signal	EIA Standard RS 422
Operating temperature range	-40...+100 °C
Moment of inertia of code wheel	≤ 0.09 gcm²
Output current per channel	± 20 mA
Hysteresis	0.17 °m
Min. state duration s	125 ns
Signal rise and fall times (typically, at C_L = 200 pF, R_L = 100 Ω)	20 ns

The angle value 0 is matched to the commutation phase of winding 1 (in acc. with Hall 1 signal on motors with Hall sensors, block commutation), see p. 46.

Additional information can be found in the maxon online shop under downloads.
The index signal I is synchronized with channel A or B.

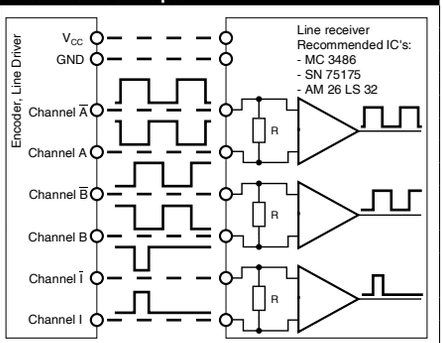
Pin Allocation



1 N.C.
2 V_{CC}
3 GND
4 N.C.
5 Channel $\overline{A}$
6 Channel A
7 Channel $\overline{B}$
8 Channel B
9 Channel $\overline{I}$ (Index)
10 Channel I (Index)

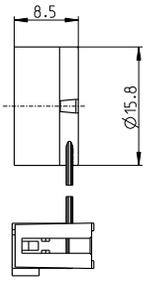
DIN Connector 41651/
EN 60603-13
flat band cable AWG 28

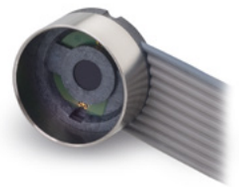
Connection example

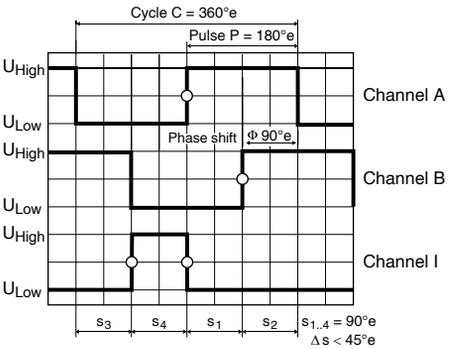


Opt. terminal resistance R = typical 120 Ω

Encoder 16 EASY 128–1024 CPT, 3 Channels, with Line Driver RS 422



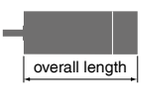


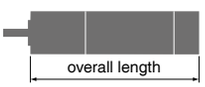


Direction of rotation cw (definition cw p. 68)

Stock program
Standard program
Special program (on request)

Part Numbers	499356	499357	499358	499359	499360	499361
Type (provisional)						
Counts per turn	128	256	500	512	1000	1024
Number of channels	3	3	3	3	3	3
Max. operating frequency (kHz)	1600	1600	1600	1600	1600	1600
Max. speed (rpm)	30 000	30 000	30 000	30 000	30 000	30 000
Phase shift Φ (°e)	90 ± 45	90 ± 45	90 ± 60	90 ± 45	90 ± 80	90 ± 70
Index pulse width (°e)	90 ± 45	90 ± 45	90 ± 60	90 ± 45	90 ± 80	90 ± 70





maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / • see Gearhead					
EC-i 30, 50 W	260					75.7	75.7	75.7	75.7	75.7	75.7
EC-i 30, 50 W	260	GP 32, 1.0 - 6.0 Nm	388			•	•	•	•	•	•
EC-i 30, 50 W	260	GP 32 S	416-421			•	•	•	•	•	•
EC-i 30, 75 W	261					75.7	75.7	75.7	75.7	75.7	75.7
EC-i 30, 75 W	261	GP 32, 1.0 - 6.0 Nm	388			•	•	•	•	•	•
EC-i 30, 75 W	261	GP 32 S	416-421			•	•	•	•	•	•
EC-i 40, 50 W	262-263					37.7	37.7	37.7	37.7	37.7	37.7
EC-i 40, 50 W	262	GP 32, 1.0 - 6.0 Nm	388			•	•	•	•	•	•
EC-i 40, 50 W	262	GP 32 S	416-421			•	•	•	•	•	•
EC-i 40, 50 W	262-263	GP 42, 3.0 - 15.0 Nm	396			•	•	•	•	•	•
EC-i 40, 70 W	264-265					47.7	47.7	47.7	47.7	47.7	47.7
EC-i 40, 70 W	264	GP 32, 1.0 - 6.0 Nm	388			•	•	•	•	•	•
EC-i 40, 70 W	264	GP 32 S	416-421			•	•	•	•	•	•
EC-i 40, 70 W	264-265	GP 42, 3.0 - 15.0 Nm	396			•	•	•	•	•	•
EC-i 40, 100 W	266					67.7	67.7	67.7	67.7	67.7	67.7
EC-i 40, 100 W	266	GP 42, 3.0 - 15.0 Nm	396			•	•	•	•	•	•
EC-i 40, 130 W	267					102.5	102.5	102.5	102.5	102.5	102.5
EC-i 40, 130 W	267	GP 42, 3.0 - 15.0 Nm	396			•	•	•	•	•	•
EC-i 52, 180 W	268					93.7	93.7	93.7	93.7	93.7	93.7
EC-i 52, 180 W	268	GP 52, 4.0 - 30.0 Nm	401			•	•	•	•	•	•
EC-i 52, 200 W	269					123.7	123.7	123.7	123.7	123.7	123.7
EC-i 52, 200 W	269	GP 52, 4.0 - 30.0 Nm	401			•	•	•	•	•	•
EC-i 52, 250 W	270					93.7	93.7	93.7	93.7	93.7	93.7
EC-i 52, 420 W	271					93.7	93.7	93.7	93.7	93.7	93.7

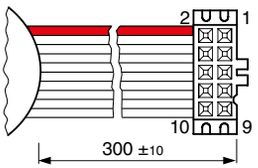
Technical Data

Supply voltage V_{CC}	5 V ± 10%
Typical current draw	22 mA
Output signal	EIA Standard RS 422
Operating temperature range	-40...+100 °C
Moment of inertia of code wheel	≤ 0.09 gcm²
Output current per channel	± 20 mA
Hysteresis	0.17 °m
Min. state duration s	125 ns
Signal rise and fall times (typically, at C_L = 200 pF, R_L = 100 Ω)	20 ns

The angle value 0 is matched to the commutation phase of winding 1 (in acc. with Hall 1 signal on motors with Hall sensors, block commutation), see p. 46.

Additional information can be found in the maxon online shop under downloads.
The index signal I is synchronized with channel A or B.

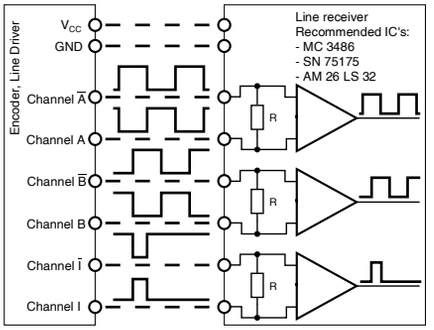
Pin Allocation



1 N.C.
2 V_{CC}
3 GND
4 N.C.
5 Channel $\overline{A}$
6 Channel A
7 Channel $\overline{B}$
8 Channel B
9 Channel $\overline{I}$ (Index)
10 Channel I (Index)

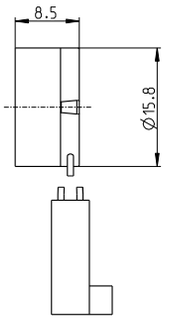
DIN Connector 41651/
EN 60603-13
flat band cable AWG 28

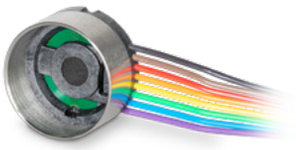
Connection example

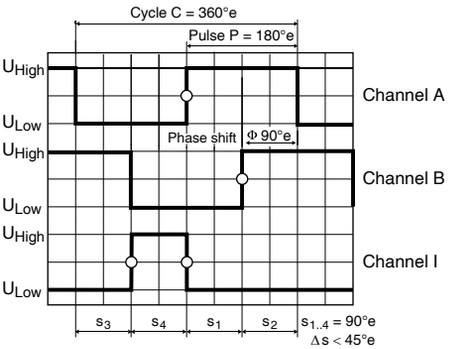


Opt. terminal resistance R = typical 120 Ω

Encoder 16 EASY XT 128–1024 CPT, 3 Channels, with Line Driver RS 422





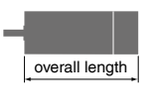


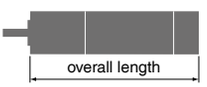
Direction of rotation cw (definition cw p. 68)

sensor

Stock program
Standard program
Special program (on request)

Part Numbers	584776	606052	577614	542079	577671	530965
Type (provisional)						
Counts per turn	128	256	500	512	1000	1024
Number of channels	3	3	3	3	3	3
Max. operating frequency (kHz)	1600	1600	1600	1600	1600	1600
Max. speed (rpm)	30000	30000	30000	30000	30000	30000
Phase shift Φ (°e)	90 ± 45	90 ± 45	90 ± 60	90 ± 45	90 ± 80	90 ± 70
Index pulse width (°e)	90 ± 45	90 ± 45	90 ± 60	90 ± 45	90 ± 80	90 ± 70





maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / • see Gearhead					
EC-4pole 22, 90 W	247					60.8	60.8	60.8	60.8	60.8	60.8
EC-4pole 22, 90 W	247	GP 22, 2.0 - 3.4 Nm	378			•	•	•	•	•	•
EC-4pole 22, 90 W	247	GP 32, 1.0 - 6.0 Nm	388			•	•	•	•	•	•
EC-4pole 22, 90 W	247	GP 32 S	416-421			•	•	•	•	•	•
EC-4pole 22, 120 W	248					78.2	78.2	78.2	78.2	78.2	78.2
EC-4pole 22, 120 W	248	GP 22, 2.0 - 3.4 Nm	378			•	•	•	•	•	•
EC-4pole 22, 120 W	248	GP 32, 1.0 - 6.0 Nm	388			•	•	•	•	•	•
EC-4pole 22, 120 W	248	GP 32 S	416-421			•	•	•	•	•	•
EC-4pole 30, 100 W	249					60.9	60.9	60.9	60.9	60.9	60.9
EC-4pole 30, 100 W	249	GP 32, 4.0 - 8.0 Nm	391			•	•	•	•	•	•
EC-4pole 30, 100 W	249	GP 42, 3.0 - 15.0 Nm	397			•	•	•	•	•	•
EC-4pole 30, 100 W	249			AB 20	516	97.3	97.3	97.3	97.3	97.3	97.3
EC-4pole 30, 100 W	249	GP 32, 4.0 - 8.0 Nm	391	AB 20	516	•	•	•	•	•	•
EC-4pole 30, 100 W	249	GP 42, 3.0 - 15.0 Nm	397	AB 20	516	•	•	•	•	•	•
EC-4pole 30, 200 W	251					77.9	77.9	77.9	77.9	77.9	77.9
EC-4pole 30, 200 W	251	GP 32, 4.0 - 8.0 Nm	391			•	•	•	•	•	•
EC-4pole 30, 200 W	251	GP 42, 3.0 - 15.0 Nm	397			•	•	•	•	•	•
EC-4pole 30, 200 W	251			AB 20	516	114.3	114.3	114.3	114.3	114.3	114.3
EC-4pole 30, 200 W	251	GP 32, 4.0 - 8.0 Nm	391	AB 20	516	•	•	•	•	•	•
EC-4pole 30, 200 W	251	GP 42, 3.0 - 15.0 Nm	397	AB 20	516	•	•	•	•	•	•
EC-i 30, 30 W	258					53.7	53.7	53.7	53.7	53.7	53.7
EC-i 30, 30 W	258	GP 32, 1.0 - 6.0 Nm	388			•	•	•	•	•	•
EC-i 30, 30 W	258	GP 32 S	416-421			•	•	•	•	•	•
EC-i 30, 45 W	259					53.7	53.7	53.7	53.7	53.7	53.7
EC-i 30, 45 W	259	GP 32, 1.0 - 6.0 Nm	388			•	•	•	•	•	•
EC-i 30, 45 W	259	GP 32 S	416-421			•	•	•	•	•	•

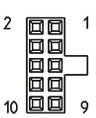
Technical Data

Supply voltage V_{CC}	5 V ± 10%
Typical current draw	22 mA
Output signal	EIA Standard RS 422
Operating temperature range	-55...+125 °C
Moment of inertia of code wheel	≤ 0.09 gcm²
Output current per channel	± 20 mA
Hysteresis	0.17 °m
Min. state duration s	125 ns
Signal rise and fall times (typically, at C_L = 200 pF, R_L = 100 Ω)	10 ns

The angle value 0 is matched to the commutation phase of winding 1 (in acc. with Hall 1 signal on motors with Hall sensors, block commutation), see p. 46.

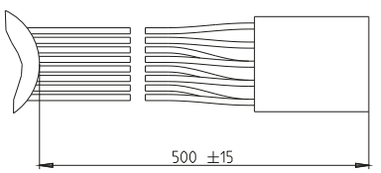
Additional information can be found in the maxon online shop under downloads.
The index signal I is synchronized with channel A or B.

Pin Allocation

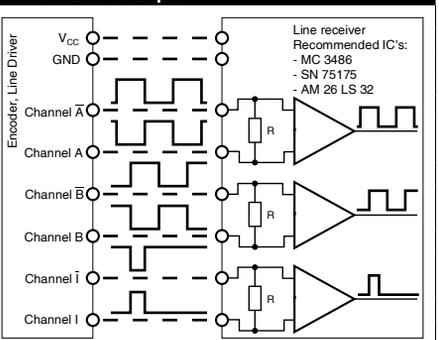


1 N.C.
2 V_{CC}
3 GND
4 N.C.
5 Channel $\overline{A}$
6 Channel A
7 Channel $\overline{B}$
8 Channel B
9 Channel $\overline{I}$ (Index)
10 Channel I (Index)

DIN Connector 41651/EN 60603-13

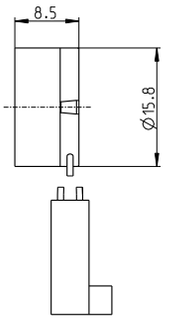


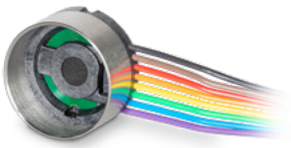
Connection example

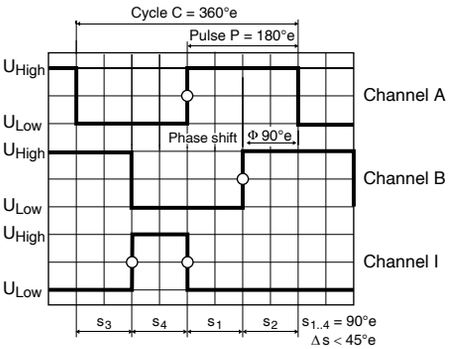


Opt. terminal resistance R = typical 120 Ω

Encoder 16 EASY XT 128–1024 CPT, 3 Channels, with Line Driver RS 422



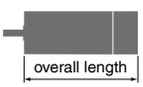


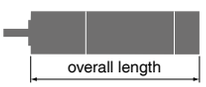


Direction of rotation cw (definition cw p. 68)

Stock program
Standard program
Special program (on request)

	Part Numbers					
	584776	606052	577614	542079	577671	530965
Type (provisional)						
Counts per turn	128	256	500	512	1000	1024
Number of channels	3	3	3	3	3	3
Max. operating frequency (kHz)	1600	1600	1600	1600	1600	1600
Max. speed (rpm)	30000	30000	30000	30000	30000	30000
Phase shift Φ (°e)	90 ± 45	90 ± 45	90 ± 60	90 ± 45	90 ± 80	90 ± 70
Index pulse width (°e)	90 ± 45	90 ± 45	90 ± 60	90 ± 45	90 ± 80	90 ± 70





maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / • see Gearhead					
EC-i 30, 50 W	260					75.7	75.7	75.7	75.7	75.7	75.7
EC-i 30, 50 W	260	GP 32, 1.0 - 6.0 Nm	388			•	•	•	•	•	•
EC-i 30, 50 W	260	GP 32 S	416-421			•	•	•	•	•	•
EC-i 30, 75 W	261					75.7	75.7	75.7	75.7	75.7	75.7
EC-i 30, 75 W	261	GP 32, 1.0 - 6.0 Nm	388			•	•	•	•	•	•
EC-i 30, 75 W	261	GP 32 S	416-421			•	•	•	•	•	•
EC-i 40, 50 W	262-263					37.7	37.7	37.7	37.7	37.7	37.7
EC-i 40, 50 W	262	GP 32, 1.0 - 6.0 Nm	388			•	•	•	•	•	•
EC-i 40, 50 W	262	GP 32 S	416-421			•	•	•	•	•	•
EC-i 40, 50 W	262-263	GP 42, 3.0 - 15.0 Nm	396			•	•	•	•	•	•
EC-i 40, 70 W	264-265					47.7	47.7	47.7	47.7	47.7	47.7
EC-i 40, 70 W	264	GP 32, 1.0 - 6.0 Nm	388			•	•	•	•	•	•
EC-i 40, 70 W	264	GP 32 S	416-421			•	•	•	•	•	•
EC-i 40, 70 W	264-265	GP 42, 3.0 - 15.0 Nm	396			•	•	•	•	•	•
EC-i 40, 100 W	266					67.7	67.7	67.7	67.7	67.7	67.7
EC-i 40, 100 W	266	GP 42, 3.0 - 15.0 Nm	396			•	•	•	•	•	•
EC-i 40, 130 W	267					102.5	102.5	102.5	102.5	102.5	102.5
EC-i 40, 130 W	267	GP 42, 3.0 - 15.0 Nm	396			•	•	•	•	•	•
EC-i 52, 180 W	268					93.7	93.7	93.7	93.7	93.7	93.7
EC-i 52, 180 W	268	GP 52, 4.0 - 30.0 Nm	401			•	•	•	•	•	•
EC-i 52, 200 W	269					123.7	123.7	123.7	123.7	123.7	123.7
EC-i 52, 200 W	269	GP 52, 4.0 - 30.0 Nm	401			•	•	•	•	•	•
EC-i 52, 250 W	270					93.7	93.7	93.7	93.7	93.7	93.7
EC-i 52, 420 W	271					93.7	93.7	93.7	93.7	93.7	93.7

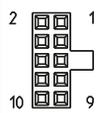
Technical Data

Supply voltage V_{CC}	5 V ± 10%
Typical current draw	22 mA
Output signal	EIA Standard RS 422
Operating temperature range	-55...+125 °C
Moment of inertia of code wheel	≤ 0.09 gcm²
Output current per channel	± 20 mA
Hysteresis	0.17 °m
Min. state duration s	125 ns
Signal rise and fall times (typically, at C_L = 200 pF, R_L = 100 Ω)	10 ns

The angle value 0 is matched to the commutation phase of winding 1 (in acc. with Hall 1 signal on motors with Hall sensors, block commutation), see p. 46.

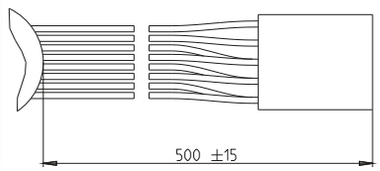
Additional information can be found in the maxon online shop under downloads.
The index signal I is synchronized with channel A or B.

Pin Allocation

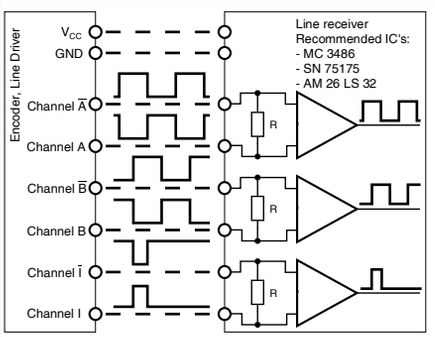


1 N.C.
2 V_{CC}
3 GND
4 N.C.
5 Channel $\overline{A}$
6 Channel A
7 Channel $\overline{B}$
8 Channel B
9 Channel $\overline{I}$ (Index)
10 Channel I (Index)

DIN Connector 41651/EN 60603-13

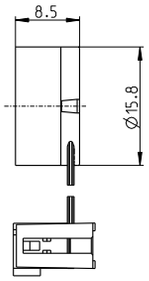


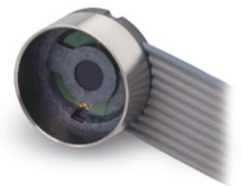
Connection example

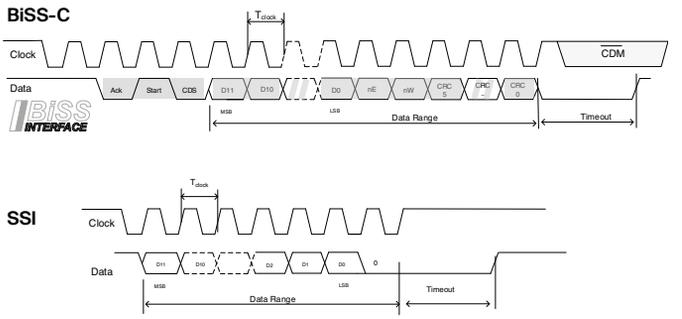


Opt. terminal resistance R = typical 120 Ω

Encoder 16 EASY Absolute 4096 steps, Single Turn



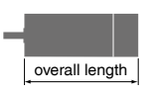




Angle values increase when direction of rotation is cw (definition of 'cw' on p. 68)

Stock program
Standard program
Special program (on request)

Part numbers	488783	488782
Type (provisional)		
Steps per turn	4096	4096
Resolution (bit single turn)	12	12
Signal protocol	BiSS-C	SSI
Max. mech. speed (rpm)	30 000	30 000
Data encoding	Binary	Gray Symmetric
Min. clock frequency CLK (MHz)	0.6	0.04
Max. clock frequency CLK (MHz)	10	4
Min. timeout (µs)	2	16



maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead	
EC-4pole 22, 90 W	247					60.8	60.8
EC-4pole 22, 90 W	247	GP 22, 2.0 - 3.4 Nm	378			●	●
EC-4pole 22, 90 W	247	GP 32, 1.0 - 6.0 Nm	388			●	●
EC-4pole 22, 90 W	247	GP 32 S	416-421			●	●
EC-4pole 22, 120 W	248					78.2	78.2
EC-4pole 22, 120 W	248	GP 22, 2.0 - 3.4 Nm	378			●	●
EC-4pole 22, 120 W	248	GP 32, 1.0 - 6.0 Nm	388			●	●
EC-4pole 22, 120 W	248	GP 32 S	416-421			●	●
EC-4pole 30, 100 W	249					60.9	60.9
EC-4pole 30, 100 W	249	GP 32, 4.0 - 8.0 Nm	391			●	●
EC-4pole 30, 100 W	249	GP 42, 3.0 - 15.0 Nm	397			●	●
EC-4pole 30, 100 W	249			AB 20	516	97.3	97.3
EC-4pole 30, 100 W	249	GP 32, 4.0 - 8.0 Nm	391	AB 20	516	●	●
EC-4pole 30, 100 W	249	GP 42, 3.0 - 15.0 Nm	397	AB 20	516	●	●
EC-4pole 30, 200 W	251					77.9	77.9
EC-4pole 30, 200 W	251	GP 32, 4.0 - 8.0 Nm	391			●	●
EC-4pole 30, 200 W	251	GP 42, 3.0 - 15.0 Nm	397			●	●
EC-4pole 30, 200 W	251			AB 20	516	114.3	114.3
EC-4pole 30, 200 W	251	GP 32, 4.0 - 8.0 Nm	391	AB 20	516	●	●
EC-4pole 30, 200 W	251	GP 42, 3.0 - 15.0 Nm	397	AB 20	516	●	●
EC-i 30, 30 W	258					53.7	53.7
EC-i 30, 30 W	258	GP 32, 1.0 - 6.0 Nm	388			●	●
EC-i 30, 30 W	258	GP 32 S	416-421			●	●
EC-i 30, 45 W	259					53.7	53.7
EC-i 30, 45 W	259	GP 32, 1.0 - 6.0 Nm	388			●	●
EC-i 30, 45 W	259	GP 32 S	416-421			●	●

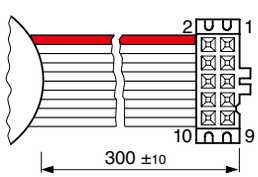
Technical data

Supply voltage V_{CC}	5 V ± 10%
Typical current draw	17 mA
Output signal	CMOS compatible
Output current, data	max. 20 mA
Current draw, typ. (no load)	17 mA
Setup time after Power On	max. 4 ms
Hysteresis	0.17° mech
Moment of inertia of code wheel	≤ 0.09 gcm²
Operating temperature range	-40...+100 °C

The angle value 0 is matched to the commutation phase of winding 1 (in acc. with Hall 1 signal on motors with Hall sensors, block commutation), see p. 46.

Additional information can be found under 'Downloads' in the maxon online shop.

Pin assignment



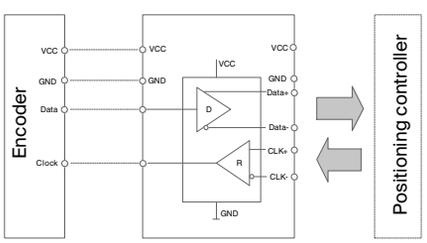
1 Data
2 V_{CC}
3 GND
4 CLK
5 Do not connect (Ā)
6 Do not connect (A)
7 Do not connect (B̄)
8 Do not connect (B)
9 Do not connect (Ī)
10 Do not connect (I)

DIN Connector 41651/
EN 60603-13
flat ribbon cable AWG 28

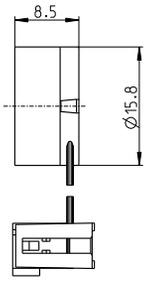
Adapter EASY Absolute **488167**
(required for all maxon controllers).

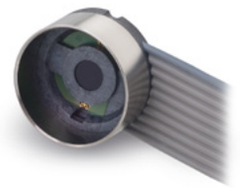
Connection example

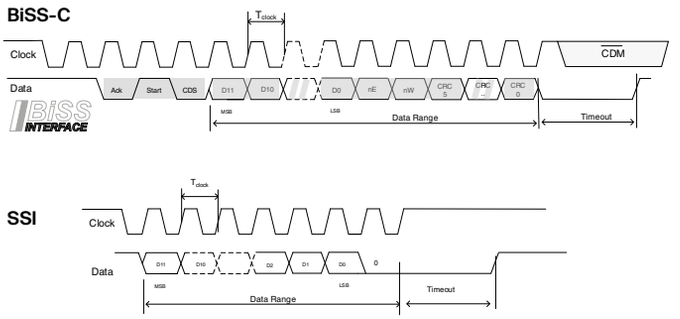
Adapter EASY Absolute **488167**



Encoder 16 EASY Absolute 4096 steps, Single Turn



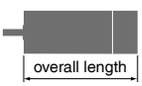




Angle values increase when direction of rotation is cw (definition of 'cw' on p. 68)

Stock program
Standard program
Special program (on request)

Part numbers	488783	488782
Type (provisional)		
Steps per turn	4096	4096
Resolution (bit single turn)	12	12
Signal protocol	BiSS-C	SSI
Max. mech. speed (rpm)	30 000	30 000
Data encoding	Binary	Gray Symmetric
Min. clock frequency CLK (MHz)	0.6	0.04
Max. clock frequency CLK (MHz)	10	4
Min. timeout (µs)	2	16



maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead	
EC-i 30, 50 W	260					75.7	75.7
EC-i 30, 50 W	260	GP 32, 1.0 - 6.0 Nm	388			●	●
EC-i 30, 50 W	260	GP 32 S	416-421			●	●
EC-i 30, 75 W	261					75.7	75.7
EC-i 30, 75 W	261	GP 32, 1.0 - 6.0 Nm	388			●	●
EC-i 30, 75 W	261	GP 32 S	416-421			●	●
EC-i 40, 50 W	262-263					37.7	37.7
EC-i 40, 50 W	262	GP 32, 1.0 - 6.0 Nm	388			●	●
EC-i 40, 50 W	262	GP 32 S	416-421			●	●
EC-i 40, 50 W	262-263	GP 42, 3.0 - 15.0 Nm	396			●	●
EC-i 40, 70 W	264-265					47.7	47.7
EC-i 40, 70 W	264	GP 32, 1.0 - 6.0 Nm	388			●	●
EC-i 40, 70 W	264	GP 32 S	416-421			●	●
EC-i 40, 70 W	264-265	GP 42, 3.0 - 15.0 Nm	396			●	●
EC-i 40, 100 W	266					67.7	67.7
EC-i 40, 100 W	266	GP 42, 3.0 - 15.0 Nm	396			●	●
EC-i 40, 130 W	267					102.5	102.5
EC-i 40, 130 W	267	GP 42, 3.0 - 15.0 Nm	396			●	●
EC-i 52, 180 W	268					93.7	93.7
EC-i 52, 180 W	268	GP 52, 4.0 - 30.0 Nm	401			●	●
EC-i 52, 200 W	269					123.7	123.7
EC-i 52, 200 W	269	GP 52, 4.0 - 30.0 Nm	401			●	●
EC-i 52, 250 W	270					93.7	93.7
EC-i 52, 420 W	271					93.7	93.7

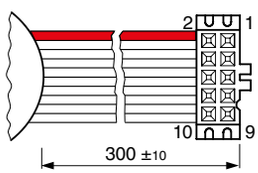
Technical data

Supply voltage V_{CC}	5 V ± 10%
Typical current draw	17 mA
Output signal	CMOS compatible
Output current, data	max. 20 mA
Current draw, typ. (no load)	17 mA
Setup time after Power On	max. 4 ms
Hysteresis	0.17° mech
Moment of inertia of code wheel	≤ 0.09 gcm²
Operating temperature range	-40...+100 °C

The angle value 0 is matched to the commutation phase of winding 1 (in acc. with Hall 1 signal on motors with Hall sensors, block commutation), see p. 46.

Additional information can be found under 'Downloads' in the maxon online shop.

Pin assignment



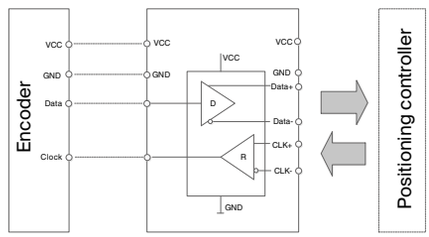
1 Data
2 V_{CC}
3 GND
4 CLK
5 Do not connect ($\overline{A}$)
6 Do not connect (A)
7 Do not connect ($\overline{B}$)
8 Do not connect (B)
9 Do not connect ($\overline{I}$)
10 Do not connect (I)

DIN Connector 41651/
EN 60603-13
flat ribbon cable AWG 28

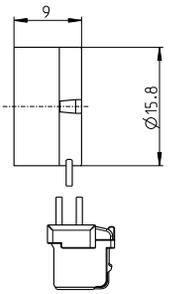
Adapter EASY Absolute **488167**
(required for all maxon controllers).

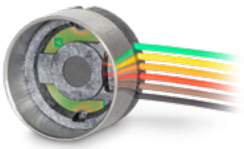
Connection example

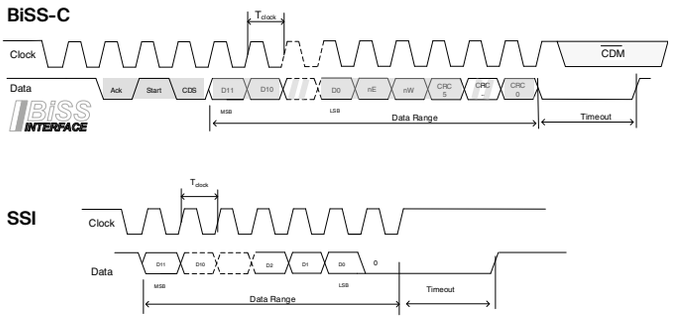
Adapter EASY Absolute **488167**



Encoder 16 EASY Absolute XT 4096 steps, Single Turn



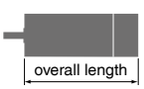




Angle values increase when direction of rotation is cw (definition of 'cw' on p. 68)

Stock program
Standard program
Special program (on request)

Part numbers	588632	588631
Type (provisional)		
Steps per turn	4096	4096
Resolution (bit single turn)	12	12
Signal protocol	BiSS-C	SSI
Max. mech. speed (rpm)	30 000	30 000
Data encoding	Binary	Gray Symmetric
Min. clock frequency CLK (MHz)	0.05	0.04
Max. clock frequency CLK (MHz)	10	4
Min. timeout (µs)	adaptive	20



maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / • see Gearhead	
EC-4pole 22, 90 W	247					61.3	61.3
EC-4pole 22, 90 W	247	GP 22, 2.0 - 3.4 Nm	378			•	•
EC-4pole 22, 90 W	247	GP 32, 1.0 - 6.0 Nm	388			•	•
EC-4pole 22, 90 W	247	GP 32 S	416-421			•	•
EC-4pole 22, 120 W	248					78.7	78.2
EC-4pole 22, 120 W	248	GP 22, 2.0 - 3.4 Nm	378			•	•
EC-4pole 22, 120 W	248	GP 32, 1.0 - 6.0 Nm	388			•	•
EC-4pole 22, 120 W	248	GP 32 S	416-421			•	•
EC-4pole 30, 100 W	249					61.4	61.4
EC-4pole 30, 100 W	249	GP 32, 4.0 - 8.0 Nm	391			•	•
EC-4pole 30, 100 W	249	GP 42, 3.0 - 15.0 Nm	397			•	•
EC-4pole 30, 100 W	249			AB 20	516	97.8	97.8
EC-4pole 30, 100 W	249	GP 32, 4.0 - 8.0 Nm	391	AB 20	516	•	•
EC-4pole 30, 100 W	249	GP 42, 3.0 - 15.0 Nm	397	AB 20	516	•	•
EC-4pole 30, 200 W	251					78.4	78.4
EC-4pole 30, 200 W	251	GP 32, 4.0 - 8.0 Nm	391			•	•
EC-4pole 30, 200 W	251	GP 42, 3.0 - 15.0 Nm	397			•	•
EC-4pole 30, 200 W	251			AB 20	516	114.8	114.8
EC-4pole 30, 200 W	251	GP 32, 4.0 - 8.0 Nm	391	AB 20	516	•	•
EC-4pole 30, 200 W	251	GP 42, 3.0 - 15.0 Nm	397	AB 20	516	•	•
EC-i 30, 30 W	258					54.2	54.2
EC-i 30, 30 W	258	GP 32, 1.0 - 6.0 Nm	388			•	•
EC-i 30, 30 W	258	GP 32 S	416-421			•	•
EC-i 30, 45 W	259					54.2	54.2
EC-i 30, 45 W	259	GP 32, 1.0 - 6.0 Nm	388			•	•
EC-i 30, 45 W	259	GP 32 S	416-421			•	•

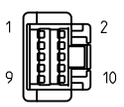
Technical data

Supply voltage V_{CC}	5 V ± 5%
Typical current draw	22 mA
Output signal	EIA Standard RS 422
Output current, data	max. 20 mA
Setup time after Power On	max. 4 ms
Moment of inertia of code wheel	≤ 0.09 gcm²
Operating temperature range	-55...+125 °C

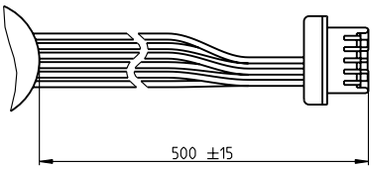
The angle value 0 is matched to the commutation phase of winding 1 (in acc. with Hall 1 signal on motors with Hall sensors, block commutation), see p. 46.

Additional information can be found under 'Downloads' in the maxon online shop.

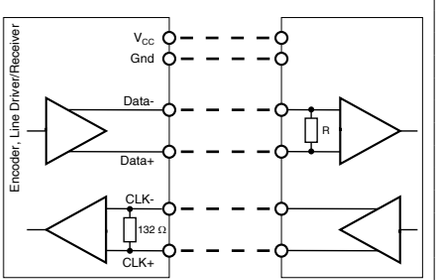
Pin assignment



1	Not connected
2	Not connected
3	Not connected
4	Not connected
5	CLK
6	CLK\
7	Data
8	Data\
9	GND
10	Vcc

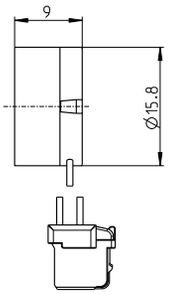


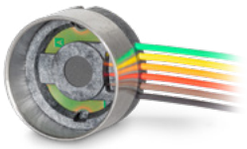
Connection example

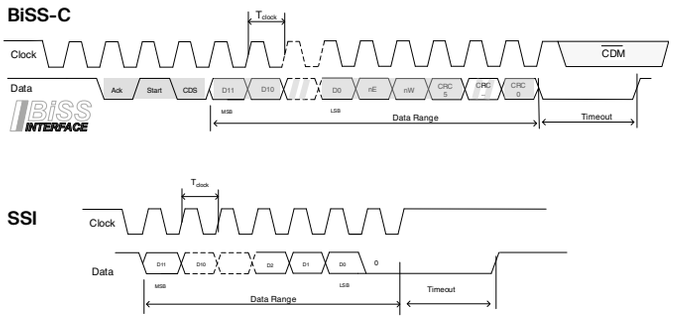


Opt. terminal resistance R = typical 120 Ω

Encoder 16 EASY Absolute XT 4096 steps, Single Turn



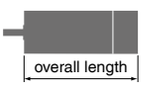




Angle values increase when direction of rotation is cw (definition of 'cw' on p. 68)

Stock program
Standard program
Special program (on request)

Type (provisional)	Part numbers	
	588632	588631
Steps per turn	4096	4096
Resolution (bit single turn)	12	12
Signal protocol	BiSS-C	SSI
Max. mech. speed (rpm)	30 000	30 000
Data encoding	Binary	Gray Symmetric
Min. clock frequency CLK (MHz)	0.05	0.04
Max. clock frequency CLK (MHz)	10	4
Min. timeout (µs)	adaptive	20



maxon Modular System						Overall length [mm] / • see Gearhead	
+ Motor	Page	+ Gearhead	Page	+ Brake	Page		
EC-i 30, 50 W	260					76.2	76.2
EC-i 30, 50 W	260	GP 32, 1.0 - 6.0 Nm	388			•	•
EC-i 30, 50 W	260	GP 32 S	416-421			•	•
EC-i 30, 75 W	261					76.2	76.2
EC-i 30, 75 W	261	GP 32, 1.0 - 6.0 Nm	388			•	•
EC-i 30, 75 W	261	GP 32 S	416-421			•	•
EC-i 40, 50 W	262-263					38.2	38.2
EC-i 40, 50 W	262	GP 32, 1.0 - 6.0 Nm	388			•	•
EC-i 40, 50 W	262	GP 32 S	416-421			•	•
EC-i 40, 50 W	262-263	GP 42, 3.0 - 15.0 Nm	396			•	•
EC-i 40, 70 W	264-265					48.2	48.2
EC-i 40, 70 W	264	GP 32, 1.0 - 6.0 Nm	388			•	•
EC-i 40, 70 W	264	GP 32 S	416-421			•	•
EC-i 40, 70 W	264-265	GP 42, 3.0 - 15.0 Nm	396			•	•
EC-i 40, 100 W	266					68.2	68.2
EC-i 40, 100 W	266	GP 42, 3.0 - 15.0 Nm	396			•	•
EC-i 40, 130 W	267					103.0	103.0
EC-i 40, 130 W	267	GP 42, 3.0 - 15.0 Nm	396			•	•
EC-i 52, 180 W	268					94.2	94.2
EC-i 52, 180 W	268	GP 52, 4.0 - 30.0 Nm	401			•	•
EC-i 52, 200 W	269					124.2	124.2
EC-i 52, 200 W	269	GP 52, 4.0 - 30.0 Nm	401			•	•
EC-i 52, 250 W	270					94.2	94.2
EC-i 52, 420 W	271					94.2	94.2

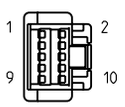
Technical data

Supply voltage V_{CC}	5 V ± 5%
Typical current draw	22 mA
Output signal	EIA Standard RS 422
Output current, data	max. 20 mA
Setup time after Power On	max. 4 ms
Moment of inertia of code wheel	≤ 0.09 gcm²
Operating temperature range	-55...+125 °C

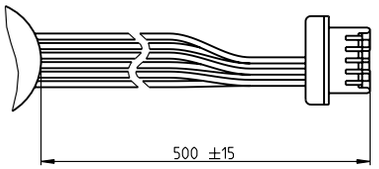
The angle value 0 is matched to the commutation phase of winding 1 (in acc. with Hall 1 signal on motors with Hall sensors, block commutation), see p. 46.

Additional information can be found under 'Downloads' in the maxon online shop.

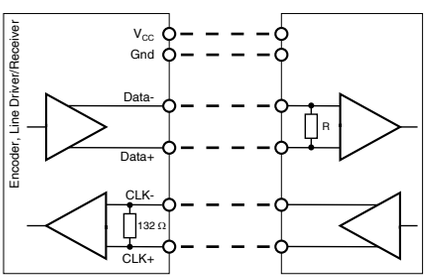
Pin assignment



1	Not connected
2	Not connected
3	Not connected
4	Not connected
5	CLK
6	CLK\
7	Data
8	Data\
9	GND
10	Vcc

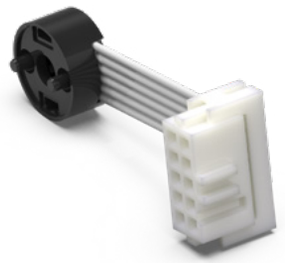


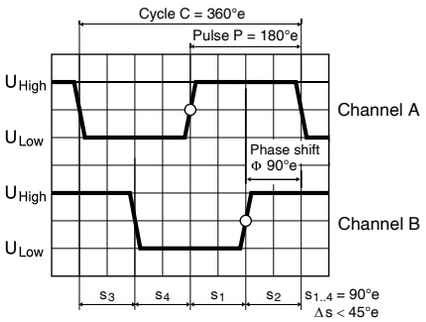
Connection example



Opt. terminal resistance R = typical 120 Ω

Encoder MR Type S, 16 CPT, 2 Channels

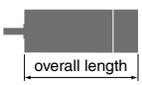


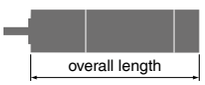


Direction of rotation cw (definition cw p. 68)

Stock program
Standard program
Special program (on request)

Part Numbers	201933	224702
Type		
Counts per turn	16	16
Number of channels	2	2
Max. operating frequency (kHz)	8	8
Max. speed (rpm)	30 000	30 000





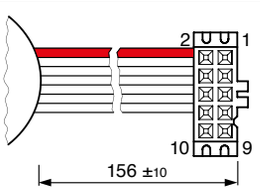
maxon Modular System

+ Motor	Page	+ Gearhead	Page	∅ Enc [mm]	Overall length [mm] / • see Gearhead	
RE 10, 0.75 W	110			10	22.8	
RE 10, 0.75 W	110	GP 10, 0.005 - 0.15 Nm	360/361	10	•	
RE 10, 1.5 W	112			10	30.4	
RE 10, 1.5 W	112	GP 10, 0.005 - 0.15 Nm	360/361	10	•	
RE 13, 0.75 W	115			13		26.3
RE 13, 0.75 W	116			13		28.7
RE 13, 0.75 W	116	GP 13, 0.05 - 0.15 Nm	363	13		•
RE 13, 0.75 W	116	GP 13, 0.2 - 0.35 Nm	364	13		•
RE 13, 2 W	119			13		38.5
RE 13, 2 W	120			13		40.9
RE 13, 2 W	120	GP 13, 0.05 - 0.15 Nm	363	13		•
RE 13, 2 W	120	GP 13, 0.2 - 0.35 Nm	364	13		•
RE 13, 1.5 W	123			13		28.4
RE 13, 1.5 W	124			13		30.8
RE 13, 1.5 W	124	GP 13, 0.05 - 0.15 Nm	363	13		•
RE 13, 1.5 W	124	GP 13, 0.2 - 0.35 Nm	364	13		•
RE 13, 3 W	127			13		40.6
RE 13, 3 W	128			13		43.0
RE 13, 3 W	128	GP 13, 0.05 - 0.15 Nm	363	13		•
RE 13, 3 W	128	GP 13, 0.2 - 0.35 Nm	364	13		•
A-max 12, 0.5 W	148			12	25.3	
A-max 12, 0.5 W	148	GP 10, 0.01 - 0.15 Nm	361	12	•	
A-max 12, 0.5 W	148	GS 12, 0.01 - 0.03 Nm	362	12	•	
A-max 12, 0.5 W	148	GP 13, 0.05 - 0.15 Nm	363	12	•	
A-max 12, 0.5 W	148	GP 13, 0.2 - 0.35 Nm	364	12	•	

Technical Data

Supply voltage V_{CC}	2.7 - 5.5 V
Typical current draw	7 mA
Output signal V_{CC} = 5 VDC	TTL compatible
Phase shift Φ	90°e ± 45°e
Operating temperature range	-40...+85°C
Moment of inertia of code wheel	≤ 0.005 gcm²
Output current per channel	max. 5 mA

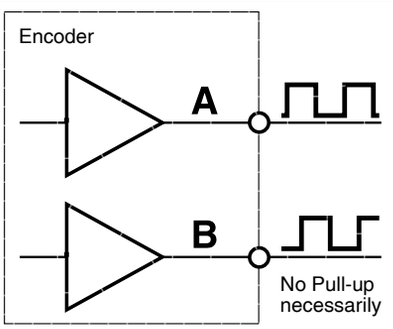
Pin Allocation



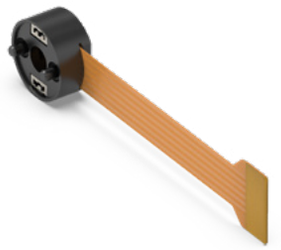
1 Motor +
2 V_{CC}
3 Channel A
4 Channel B
5 GND
6 Motor –

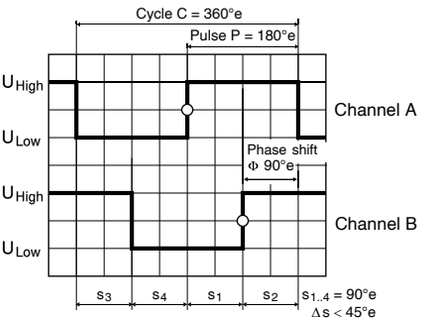
DIN Connector 41651/
EN 60603-13
flat band cable AWG 28

Connection example



Encoder MR Type S, 64–256 CPT, 2 Channels, with Line Driver

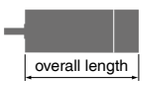


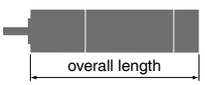


Direction of rotation cw (definition cw p. 68)

Stock program
Standard program
Special program (on request)

Part Numbers	323049	323050	334910	323051	323052	323053	323054
Type							
Counts per turn	64	64	100	128	128	256	256
Number of channels	2	2	2	2	2	2	2
Max. operating frequency (kHz)	80	80	100	160	160	320	320
Max. speed (rpm)	75000	75000	60000	75000	75000	75000	75000





maxon Modular System

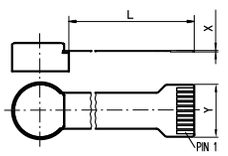
+ Motor	Page	+ Gearhead	Page	∅ Enc [mm]	Overall length [mm] / ● see Gearhead						
RE 8, 0.5 W, A	108			8			22.6				
RE 8, 0.5 W, A	108	GP 8, 0.01 - 0.1 Nm	359	8			●				
RE 8, 0.5 W, A	108	GP 8 S	409–410	8			●				
RE 10, 0.75 W	110			10	22.8			22.8		22.8	
RE 10, 0.75 W	110	GP 10, 0.005 - 0.15 Nm	360/361	10	●			●		●	
RE 10, 1.5 W	112			10	30.4			30.4		30.4	
RE 10, 1.5 W	112	GP 10, 0.005 - 0.15 Nm	360/361	10	●			●		●	
RE 13, 0.75 W	115			13		26.3			26.3		26.3
RE 13, 0.75 W	116			13		28.7			28.7		28.7
RE 13, 0.75 W	116	GP 13, 0.05 - 0.15 Nm	363	13		●			●		●
RE 13, 0.75 W	116	GP 13, 0.2 - 0.35 Nm	364	13		●			●		●
RE 13, 2 W	119			13		38.5			38.5		38.5
RE 13, 2 W	120			13		40.9			40.9		40.9
RE 13, 2 W	120	GP 13, 0.05 - 0.15 Nm	363	13		●			●		●
RE 13, 2 W	120	GP 13, 0.2 - 0.35 Nm	364	13		●			●		●
RE 13, 1.5 W	123			13		28.4			28.4		28.4
RE 13, 1.5 W	124			13		30.8			30.8		30.8
RE 13, 1.5 W	124	GP 13, 0.05 - 0.15 Nm	363	13		●			●		●
RE 13, 1.5 W	124	GP 13, 0.2 - 0.35 Nm	364	13		●			●		●
RE 13, 3 W	127			13		40.6			40.6		40.6
RE 13, 3 W	128			13		43.0			43.0		43.0
RE 13, 3 W	128	GP 13, 0.05 - 0.15 Nm	363	13		●			●		●
RE 13, 3 W	128	GP 13, 0.2 - 0.35 Nm	364	13		●			●		●
A-max 12, 0.5 W	148			12	25.3			25.3		25.3	
A-max 12, 0.5 W	148	GP 10, 0.01 - 0.15 Nm	361	12	●			●		●	
A-max 12, 0.5 W	148	GS 12, 0.01 - 0.03 Nm	362	12	●			●		●	
A-max 12, 0.5 W	148	GP 13, 0.05 - 0.15 Nm	363	12	●			●		●	
A-max 12, 0.5 W	148	GP 13, 0.2 - 0.35 Nm	364	12	●			●		●	

Technical Data

Supply voltage V_{CC}	5 V ± 5%
Typical current draw	11 mA
Output signal	TTL compatible
Phase shift Φ	90°e ± 45°e
Operating temperature range	-25...+85°C
Moment of inertia of code wheel	≤ 0.005 gcm²
Output current per channel	max. 5 mA

Pin Allocation

Part Numbers 323049 – 323054
Pin 1 – 10 / X = 0.3 ±0.05 / Y = 11 –0.1 / L = 80 ±3
Compatible connector:
Molex 52207-1033, Tyco 1-84953-0
Pitch 1.0 mm, top contact style

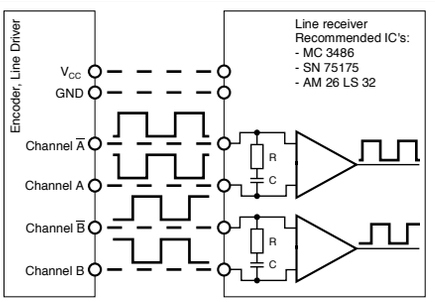


1	Motor +
2	V_{CC}
3	GND
4	Motor –
5	Channel $\overline{A}$
6	Channel A
7	Channel $\overline{B}$
8	Channel B
9	N.C.
10	N.C.

Part Numbers 334910
Pin 1 – 8 / X = 0.3 +0.05/-0.03 /
Y = 4.5 ±0.07 / L = 84 ±
Compatible connector:
Molex 52745-0897

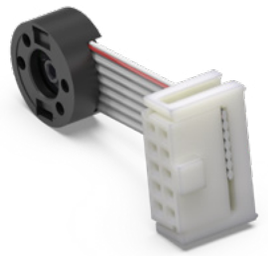
1	Motor +
2	V_{CC}
3	GND
4	Motor –
5	Channel $\overline{A}$
6	Channel A
7	Channel $\overline{B}$
8	Channel B

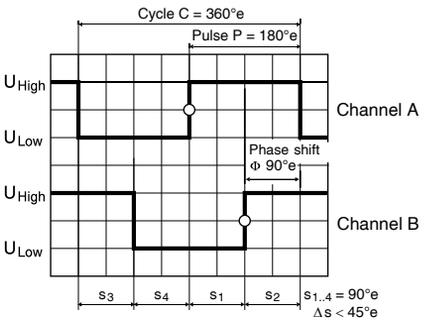
Connection example



Terminal resistance R = typical 120 Ω
Capacitor C ≥ 0.1 nF per m line length

Encoder MR Type S, 64–256 CPT, 2 Channels

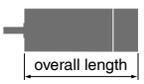


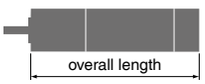


Direction of rotation cw (definition cw p. 68)

Stock program
Standard program
Special program (on request)

Part Numbers	241057	241060	241062
Type			
Counts per turn	64	128	256
Number of channels	2	2	2
Max. operating frequency (kHz)	80	160	320
Max. speed (rpm)	75000	75000	75000





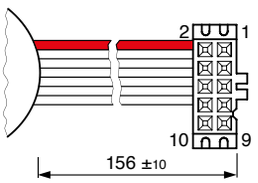
maxon Modular System

+ Motor	Page	+ Gearhead	Page	∅ Enc [mm]	Overall length [mm] / • see Gearhead		
RE 13, 0.75 W	115			13	26.3	26.3	26.3
RE 13, 0.75 W	116			13	28.7	28.7	28.7
RE 13, 0.75 W	116	GP 13, 0.05 - 0.15 Nm	363	13	•	•	•
RE 13, 0.75 W	116	GP 13, 0.2 - 0.35 Nm	364	13	•	•	•
RE 13, 2 W	119			13	38.5	38.5	38.5
RE 13, 2 W	120			13	40.9	40.9	40.9
RE 13, 2 W	120	GP 13, 0.05 - 0.15 Nm	363	13	•	•	•
RE 13, 2 W	120	GP 13, 0.2 - 0.35 Nm	364	13	•	•	•
RE 13, 1.5 W	123			13	28.4	28.4	28.4
RE 13, 1.5 W	124			13	30.8	30.8	30.8
RE 13, 1.5 W	124	GP 13, 0.05 - 0.15 Nm	363	13	•	•	•
RE 13, 1.5 W	124	GP 13, 0.2 - 0.35 Nm	364	13	•	•	•
RE 13, 3 W	127			13	40.6	40.6	40.6
RE 13, 3 W	128			13	43.0	43.0	43.0
RE 13, 3 W	128	GP 13, 0.05 - 0.15 Nm	363	13	•	•	•
RE 13, 3 W	128	GP 13, 0.2 - 0.35 Nm	364	13	•	•	•

Technical Data

Supply voltage V_{CC}	5 V ± 5%
Typical current draw	11 mA
Output signal	TTL compatible
Phase shift Φ	90°e ± 45°e
Operating temperature range	-25...+85°C
Moment of inertia of code wheel	≤ 0.005 gcm²
Output current per channel	max. 5 mA

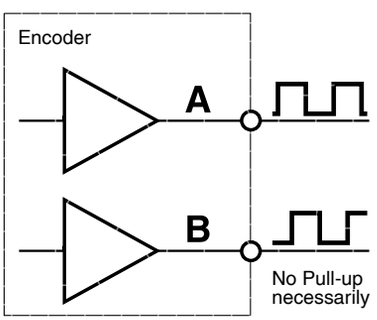
Pin Allocation



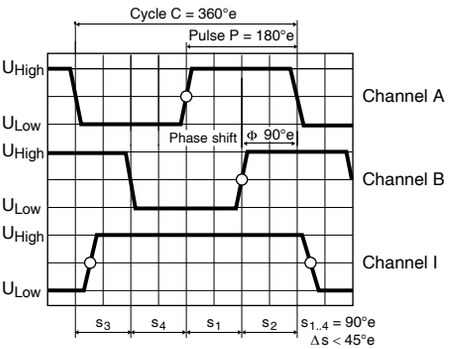
1 Motor +
2 V_{CC}
3 Channel A
4 Channel B
5 GND
6 Motor –
7 N.C.

DIN Connector 41651/
EN 60603-13
flat band cable AWG 28

Connection example



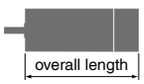
Encoder MR Type M, 32 CPT, 2/3 Channels

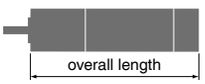


Direction of rotation cw (definition cw p. 68)

Stock program
Standard program
Special program (on request)

Part Numbers	201935	201938
Type		
Counts per turn	32	32
Number of channels	2	3
Max. operating frequency (kHz)	8	8
Max. speed (rpm)	15000	15000





maxon Modular System

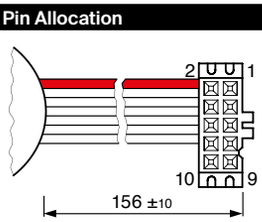
+ Motor	Page	+ Gearhead	Page	∅ Enc [mm]	Overall length [mm] / • see Gearhead	
RE 16, 2 W	129			16	28.0	28.0
RE 16, 2 W	129	GP 16, 0.1 - 0.6 Nm	369/370	16	•	•
RE 16, 2 W	129	GP 16 S	411/412	16	•	•
RE 16, 3.2 W	131			16	45.4	45.4
RE 16, 3.2 W	131	GP 16, 0.1 - 0.6 Nm	369/370	16	•	•
RE 16, 3.2 W	131	GP 16 S	411/412	16	•	•
RE 16, 4.5 W	133			16	48.4	48.4
RE 16, 4.5 W	133	GP 16, 0.1 - 0.6 Nm	369/370	16	•	•
RE 16, 4.5 W	133	GP 16 S	411/412	16	•	•
A-max 16	150/152			16	30.4	30.4
A-max 16	150/152	GS 16, 0.01 - 0.1 Nm	365-368	16	•	•
A-max 16	150/152	GP 16, 0.1 - 0.3 Nm	369	16	•	•
A-max 16	150/152	GP 16 S	411/412	16	•	•
A-max 19, 1.5 W	154			19	34.0	34.0
A-max 19, 1.5 W	154	GP 19, 0.1 - 0.3 Nm	371	19	•	•
A-max 19, 1.5 W	154	GP 22, 0.5 - 2.0 Nm	376	19	•	•
A-max 19, 1.5 W	154	GS 24, 0.1 Nm	380	19	•	•
A-max 19, 1.5 W	154	GP 22 S	414/415	19	•	•
A-max 19, 2.5 W	156			19	35.8	35.8
A-max 19, 2.5 W	156	GP 19, 0.1 - 0.3 Nm	371	19	•	•
A-max 19, 2.5 W	156	GP 22, 0.5 - 2.0 Nm	376	19	•	•
A-max 19, 2.5 W	156	GS 24, 0.1 Nm	380	19	•	•
A-max 19, 2.5 W	156	GP 22 S	414/415	19	•	•
A-max 22	158/160			22	36.9	36.9
A-max 22	158/160	GP 22, 0.1 - 0.6 Nm	372/373	22	•	•
A-max 22	158/160	GP 22, 0.5 - 2.0 Nm	372-376	22	•	•
A-max 22	158/160	GS 24, 0.1 Nm	380	22	•	•
A-max 22	158/160	GP 22 S	414/415	22	•	•

Technical Data

Supply voltage V_{CC}	2.7 – 5.5 V
Typical current draw 2 channel	6 mA
Typical current draw 3 channel	9 mA
Output signal V_{CC} = 5 VDC	TTL compatible
Phase shift Φ	90°e ± 45°e
Operating temperature range	-40...+85 °C
Moment of inertia of code wheel	≤ 0.09 gcm²
Output current per channel	max. 5 mA

The index signal I is not synchronized with channel A or B.
The length of the index signal can last more than one cycle.

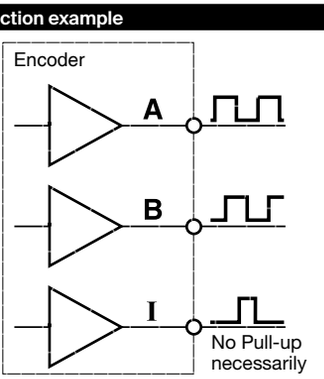
Pin Allocation



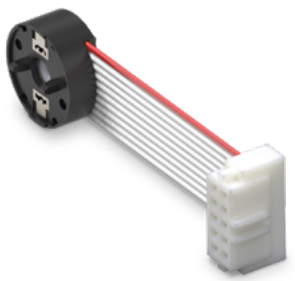
1	Motor +
2	V_{CC}
3	Channel A
4	Channel B
5	GND
6	Motor –
7*	Channel I (Index)

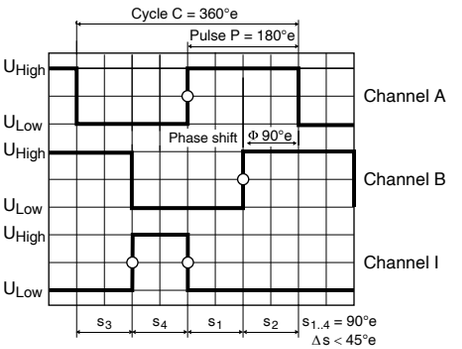
DIN Connector 41651/
EN 60603-13
flat band cable AWG 28
*version with 3 channels

Connection example



Encoder MR Type M, 128–512 CPT, 2/3 Channels, with Line Driver

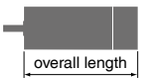


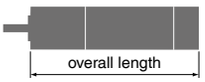


Direction of rotation cw (definition cw p. 68)

Stock program
Standard program
Special program (on request)

Part Numbers	228179	228177	228181	228182	201937	201940
Type						
Counts per turn	128	128	256	256	512	512
Number of channels	2	3	2	3	2	3
Max. operating frequency (kHz)	80	80	160	160	320	320
Max. speed (rpm)	37500	37500	37500	37500	37500	37500





maxon Modular System

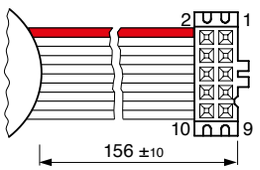
+ Motor	Page	+ Gearhead	Page	∅ Enc [mm]	Overall length [mm] / ● see Gearhead					
RE 16, 2 W	129			16	28.0	28.0	28.0	28.0	28.0	28.0
RE 16, 2 W	129	GP 16, 0.1 - 0.6 Nm	369/370	16	●	●	●	●	●	●
RE 16, 2 W	129	GP 16 S	411/412	16	●	●	●	●	●	●
RE 16, 3.2 W	131			16	45.4	45.4	45.4	45.4	45.4	45.4
RE 16, 3.2 W	131	GP 16, 0.1 - 0.6 Nm	369/370	16	●	●	●	●	●	●
RE 16, 3.2 W	131	GP 16 S	411/412	16	●	●	●	●	●	●
RE 16, 4.5 W	133			16	48.4	48.4	48.4	48.4	48.4	48.4
RE 16, 4.5 W	133	GP 16, 0.1 - 0.6 Nm	369/370	16	●	●	●	●	●	●
RE 16, 4.5 W	133	GP 16 S	411/412	16	●	●	●	●	●	●
A-max 16	150/152			16	30.4	30.4	30.4	30.4	30.4	30.4
A-max 16	150/152	GS 16, 0.01 - 0.1 Nm	365-368	16	●	●	●	●	●	●
A-max 16	150/152	GP 16, 0.1 - 0.6 Nm	369/370	16	●	●	●	●	●	●
A-max 16	150/152	GP 16 S	411/412	16	●	●	●	●	●	●
A-max 19, 1.5 W	154			19	34.0	34.0	34.0	34.0	34.0	34.0
A-max 19, 1.5 W	154	GP 19, 0.1 - 0.3 Nm	371	19	●	●	●	●	●	●
A-max 19, 1.5 W	154	GP 22, 0.5 - 2.0 Nm	374/376	19	●	●	●	●	●	●
A-max 19, 1.5 W	154	GS 24, 0.1 Nm	380	19	●	●	●	●	●	●
A-max 19, 1.5 W	154	GP 22 S	414/415	19	●	●	●	●	●	●
A-max 19, 2.5 W	156			19	35.8	35.8	35.8	35.8	35.8	35.8
A-max 19, 2.5 W	156	GP 19, 0.1 - 0.3 Nm	371	19	●	●	●	●	●	●
A-max 19, 2.5 W	156	GP 22, 0.5 - 2.0 Nm	374/376	19	●	●	●	●	●	●
A-max 19, 2.5 W	156	GS 24, 0.1 Nm	380	19	●	●	●	●	●	●
A-max 19, 2.5 W	156	GP 22 S	414/415	19	●	●	●	●	●	●
A-max 22	158/160			22	36.9	36.9	36.9	36.9	36.9	36.9
A-max 22	158/160	GP 22, 0.1 - 0.6 Nm	372/373	22	●	●	●	●	●	●
A-max 22	158/160	GP 22, 0.5 - 2.0 Nm	374/376	22	●	●	●	●	●	●
A-max 22	158/160	GS 24, 0.1 Nm	380	22	●	●	●	●	●	●
A-max 22	158/160	GP 22 S	414/415	22	●	●	●	●	●	●

Technical Data

Supply voltage V_{CC}	5 V ± 5%
Typical current draw 2 channel	11 mA
Typical current draw 3 channel	14 mA
Output signal	TTL compatible
Phase shift Φ	90°e ± 45°e
Index pulse width	90°e ± 45°e
Operating temperature range	-25...+85°C
Moment of inertia of code wheel	≤ 0.09 gcm²
Output current per channel	max. 5 mA

The index signal I is synchronized with channel A or B.

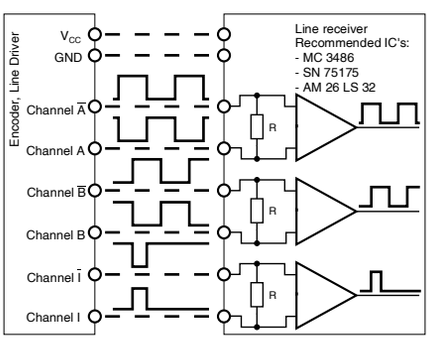
Pin Allocation



1 Motor +
2 V_{CC}
3 GND
4 Motor –
5 Channel $\overline{A}$
6 Channel A
7 Channel $\overline{B}$
8 Channel B
9* Channel $\overline{I}$ (Index)
10* Channel I (Index)

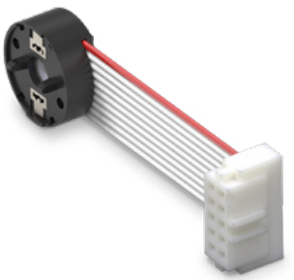
DIN Connector 41651/
EN 60603-13
flat band cable AWG 28
*version with 3 channels

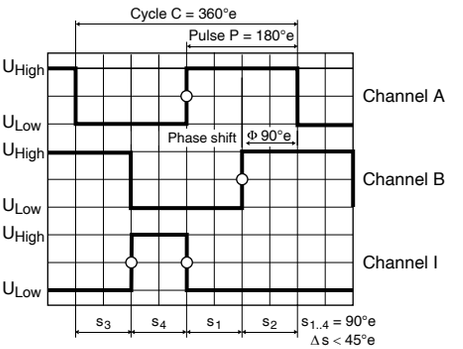
Connection example



Opt. terminal resistance R > 1 kΩ

Encoder MR Type M, 128–512 CPT, 2/3 Channels, with Line Driver





Direction of rotation cw (definition cw p. 68)

Stock program
Standard program
Special program (on request)

	Part Numbers					
Type	228179	228177	228181	228182	201937	201940
Counts per turn	128	128	256	256	512	512
Number of channels	2	3	2	3	2	3
Max. operating frequency (kHz)	80	80	160	160	320	320
Max. speed (rpm)	37500	37500	37500	37500	37500	37500

maxon Modular System

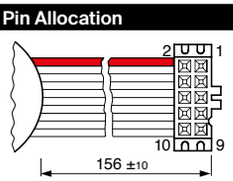
+ Motor	Page	+ Gearhead	Page	∅ Enc [mm]	Overall length [mm] / ● see Gearhead					
EC-max 16, 5 W	235			16	31.3	31.3	31.3	31.3	31.3	31.3
EC-max 16, 5 W	235	GP 16, 0.1 - 0.6 Nm	369/370	16	●	●	●	●	●	●
EC-max 16, 5 W	235	GP 16 S	411–413	16	●	●	●	●	●	●
EC-max 16, 8 W	237			16	43.3	43.3	43.3	43.3	43.3	43.3
EC-max 16, 8 W	237	GP 16, 0.2 - 0.6 Nm	370	16	●	●	●	●	●	●
EC-max 16, 8 W	237	GP 22, 0.5 - 2.0 Nm	377	16	●	●	●	●	●	●
EC-max 16, 8 W	237	GP 16 S/GP 22 S	411/415	16	●	●	●	●	●	●
EC-max 22, 12 W	238			16	41.7	41.7	41.7	41.7	41.7	41.7
EC-max 22, 12 W	238	GP 22, 0.5 - 2.0 Nm	377	16	●	●	●	●	●	●
EC-max 22, 12 W	238	KD 32, 1.0 - 4.5 Nm	394	16	●	●	●	●	●	●
EC-max 22, 12 W	238	GP 22 S	414/415	16	●	●	●	●	●	●
EC-max 22, 25 W	239			16	58.2	58.2	58.2	58.2	58.2	58.2
EC-max 22, 25 W	239	GP 22/GP 32	378/388	16	●	●	●	●	●	●
EC-max 22, 25 W	239	GP 32 S	416-421	16	●	●	●	●	●	●

Technical Data

Supply voltage V_{CC}	5 V ± 5%
Typical current draw 2 channel	11 mA
Typical current draw 3 channel	14 mA
Output signal	TTL compatible
Phase shift Φ	90°e ± 45°e
Index pulse width	90°e ± 45°e
Operating temperature range	-25...+85°C
Moment of inertia of code wheel	≤ 0.09 gcm²
Output current per channel	max. 5 mA

The index signal I is synchronized with channel A or B.

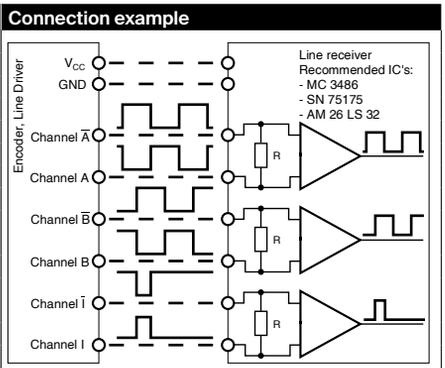
Pin Allocation



1 N.C.
2 V_{CC}
3 GND
4 N.C.
5 Channel $\overline{A}$
6 Channel A
7 Channel $\overline{B}$
8 Channel B
9* Channel $\overline{I}$ (Index)
10* Channel I (Index)

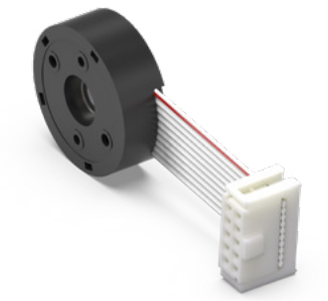
DIN Connector 41651/
EN 60603-13
flat band cable AWG 28
*version with 3 channels

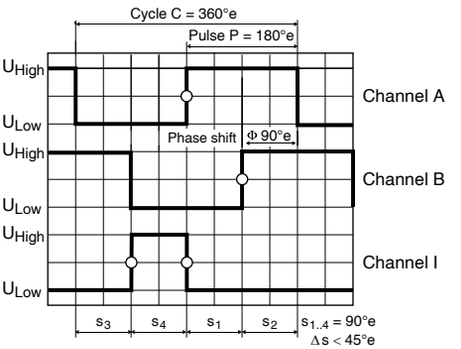
Connection example



Opt. terminal resistance R > 1 kΩ

Encoder MR Type ML, 128–1000 CPT, 3 Channels, with Line Driver

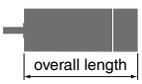


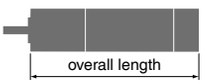


Direction of rotation cw (definition cw p. 68)

Stock program
Standard program
Special program (on request)

Part Numbers	225771	225773	225778	225805	225780
Type					
Counts per turn	128	256	500	512	1000
Number of channels	3	3	3	3	3
Max. operating frequency (kHz)	80	160	200	320	200
Max. speed (rpm)	37500	37500	24000	37500	12000





maxon Modular System

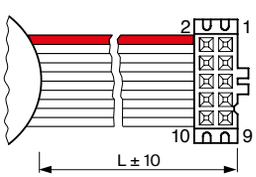
+ Motor	Page	+ Gearhead	Page	∅ Enc [mm]	Overall length [mm] / • see Gearhead				
RE 25	134/136			25	65.5	65.5	65.5	65.5	65.5
RE 25	134/136	GP 26, 0.75 - 4.5 Nm	381	25	•	•	•	•	•
RE 25	134/136	GP 32, 0.75 - 6.0 Nm	383-388	25	•	•	•	•	•
RE 25	134/136	KD 32, 1.0 - 4.5 Nm	394	25	•	•	•	•	•
RE 25	134/136	GP 32 S	416-421	25	•	•	•	•	•
RE 25, 20 W	135			25	54.0	54.0	54.0	54.0	54.0
RE 25, 20 W	135	GP 22, 0.5 - 1.0 Nm	374	25	•	•	•	•	•
RE 25, 20 W	135	GP 26, 0.75 - 4.5 Nm	381	25	•	•	•	•	•
RE 25, 20 W	135	GP 32, 0.75 - 6.0 Nm	383-388	25	•	•	•	•	•
RE 25, 20 W	135	KD 32, 1.0 - 4.5 Nm	394	25	•	•	•	•	•
RE 25, 20 W	135	GP 32 S	416-421	25	•	•	•	•	•
A-max 26	161-164			25	53.5	53.5	53.5	53.5	53.5
A-max 26	161-164	GP 26, 0.75 - 4.5 Nm	381	25	•	•	•	•	•
A-max 26	161-164	GS 30, 0.07 - 0.2 Nm	382	25	•	•	•	•	•
A-max 26	161-164	GP 32, 0.75 - 6.0 Nm	383-388	25	•	•	•	•	•
A-max 26	161-164	GS 38, 0.1 - 0.6 Nm	395	25	•	•	•	•	•
A-max 26	161-164	GP 32 S	416-421	25	•	•	•	•	•
EC-max 30, 40 W	240			25			54.2		54.2
EC-max 30, 40 W	240	GP 32, 1 - 8.0 Nm	388/391	25			•		•
EC-max 30, 40 W	240	KD 32, 1.0 - 4.5 Nm	394	25			•		•
EC-max 30, 40 W	240	GP 32 S	416-421	25			•		•
EC-max 30, 60 W	241			25			76.2		76.2
EC-max 30, 60 W	241	GP 32, 1 - 8.0 Nm	388/391	25			•		•
EC-max 30, 60 W	241	KD 32, 1.0 - 4.5 Nm	394	25			•		•
EC-max 30, 60 W	241	GP 42, 3 - 15 Nm	397	25			•		•

Technical Data

Supply voltage V_{CC}	5 V ± 5%
Typical current draw	14 mA
Output signal	TTL compatible
Phase shift Φ	90°e ± 45°e
Index pulse width	90°e ± 45°e
Operating temperature range	-25...+85°C
Moment of inertia of code wheel	≤ 0.7 gcm²
Output current per channel	max. 5 mA

The index signal I is synchronized with channel A or B.

Pin Allocation

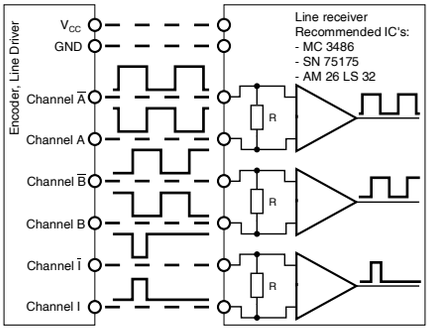


1 N.C.
2 V_{CC}
3 GND
4 N.C.
5 Channel $\overline{A}$
6 Channel A
7 Channel $\overline{B}$
8 Channel B
9 Channel $\overline{I}$ (Index)
10 Channel I (Index)

RE/A-max L = 506
EC-max L = 500

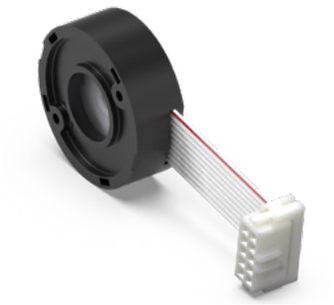
DIN Connector 41651/
EN 60603-13
flat band cable AWG 28

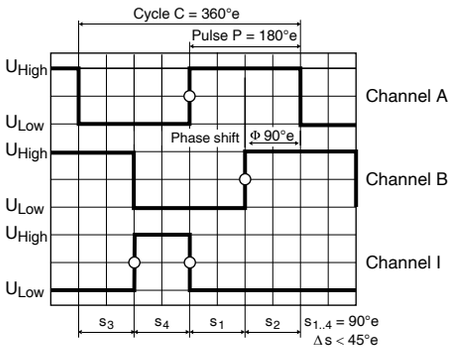
Connection example



Opt. terminal resistance R > 1 kΩ

Encoder MR Type L, 256–1024 CPT, 3 Channels, with Line Driver

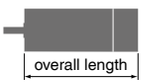


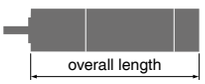


Direction of rotation cw (definition cw p. 68)

Stock program
Standard program
Special program (on request)

Part Numbers	225783	228452	225785	228456	225787
Type					
Counts per turn	256	500	512	1000	1024
Number of channels	3	3	3	3	3
Max. operating frequency (kHz)	80	200	160	200	320
Max. speed (rpm)	18750	24000	18750	12000	18750





maxon Modular System

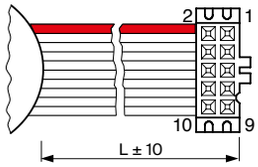
+ Motor	Page	+ Gearhead	Page	∅ Enc [mm]	Overall length [mm] / ● see Gearhead				
RE 30, 15 W	137			32	79.4	79.4	79.4	79.4	79.4
RE 30, 15 W	137	GP 32, 0.75 - 4.5 Nm	385	32	●	●	●	●	●
RE 30, 60 W	138			32	79.4	79.4	79.4	79.4	79.4
RE 30, 60 W	138	GP 32, 0.75 - 4.5 Nm	383	32	●	●	●	●	●
RE 30, 60 W	138	GP 32, 0.75 - 6.0 Nm	385-390	32	●	●	●	●	●
RE 30, 60 W	138	GP 32 S	416-421	32	●	●	●	●	●
RE 35, 90 W	139			32	82.4	82.4	82.4	82.4	82.4
RE 35, 90 W	139	GP 32, 0.75 - 4.5 Nm	383	32	●	●	●	●	●
RE 35, 90 W	139	GP 32, 0.75 - 6.0 Nm	385-390	32	●	●	●	●	●
RE 35, 90 W	139	GP 32, 4.0 - 8.0 Nm	391	32	●	●	●	●	●
RE 35, 90 W	139	GP 42, 3 - 15 Nm	396	32	●	●	●	●	●
RE 35, 90 W	139	GP 32 S	416-421	32	●	●	●	●	●
RE 40, 25 W	140			32	82.4	82.4	82.4	82.4	82.4
RE 40, 150 W	141			32	82.4	82.4	82.4	82.4	82.4
RE 40, 150 W	141	GP 42, 3 - 15 Nm	396	32	●	●	●	●	●
RE 40, 150 W	141	GP 52, 4 - 30 Nm	401	32	●	●	●	●	●
A-max 32	166			32	72.7	72.7	72.7	72.7	72.7
A-max 32	166	GP 32, 0.75 - 6.0 Nm	385-388	32	●	●	●	●	●
A-max 32	166	GS 38, 0.1 - 0.6 Nm	395	32	●	●	●	●	●
A-max 32	166	GP 32 S	416-421	32	●	●	●	●	●
EC-max 40, 70 W	242			31.8	73.9	73.9	73.9	73.9	73.9
EC-max 40, 70 W	242	GP 42, 3 - 15 Nm	397	31.8	●	●	●	●	●
EC-max 40, 120 W	243			31.8	103.9	103.9	103.9	103.9	103.9
EC-max 40, 120 W	243	GP 52, 4 - 30 Nm	402	31.8	●	●	●	●	●

Technical Data

Supply voltage V_{CC}	5 V ± 5%
Typical current draw	14 mA
Output signal	TTL compatible
Phase shift Φ	90°e ± 45°e
Index pulse width	90°e ± 45°e
Operating temperature range	-25...+85 °C
Moment of inertia of code wheel	≤ 1.7 gcm²
Output current per channel	max. 5 mA

The index signal I is synchronized with channel A or B.

Pin Allocation

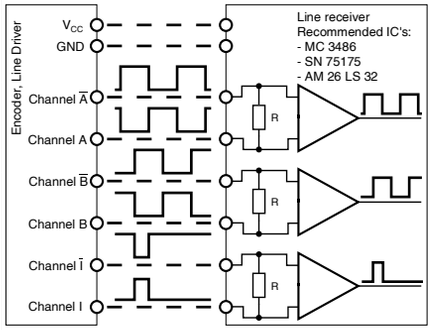


1	N.C.
2	V_{CC}
3	GND
4	N.C.
5	Channel $\overline{A}$
6	Channel A
7	Channel $\overline{B}$
8	Channel B
9	Channel $\overline{I}$ (Index)
10	Channel I (Index)

RE/A-max L = 506
EC-max L = 500

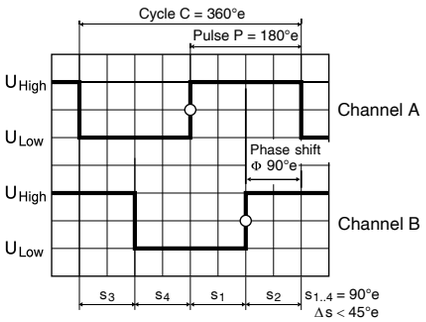
DIN Connector 41651/
EN 60603-13
flat band cable AWG 28

Connection example



Opt. terminal resistance R > 1 kΩ

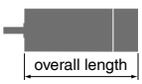
Encoder 8 OPT 50 CPT, 2 Channels

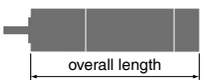


Direction of rotation cw (definition cw p. 68)

Stock program
Standard program
Special program (on request)

	Part Numbers
	473594
Type (provisional)	
Counts per turn	50
Number of channels	2
Max. operating frequency (kHz)	15
Max. speed (rpm)	18000





maxon Modular System

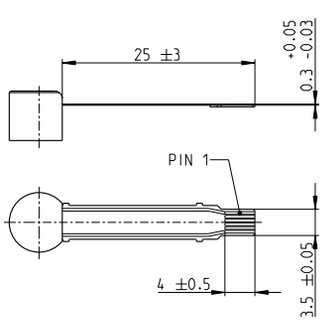
+ Motor	Page	+ Gearhead	Page		∅ Enc [mm]	Overall length [mm] / ● see Gearhead
RE 8, 0.5 W, A	108				8	24.2
RE 8, 0.5 W, A	108	GP 8, 0.01 - 0.1 Nm	359		8	●
RE 8, 0.5 W, A	108	GP 8 S	409–410		8	●

Technical Data

Supply voltage V_{CC}[1]	2.6 – 3.0 V
Typical current draw	12 mA
Phase shift Φ	90°e ± 45°e
Operating temperature range	-20...+85 °C
Moment of inertia of code wheel	≤ 0.001 gcm²
Output current per channel	min. -1 mA, max. 8 mA

[1]Not in combination with maxon controllers.

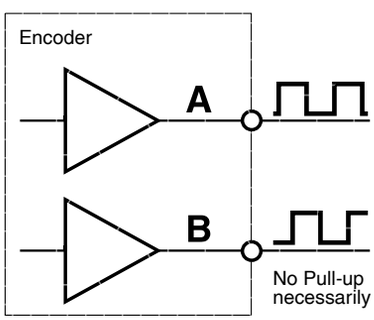
Pin Allocation



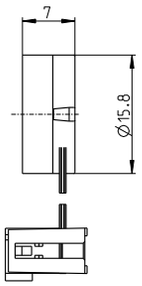
Compatible connector:
Molex 52745-0697

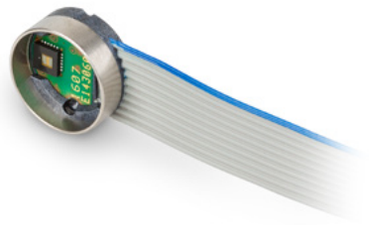
1	Motor +
2	V_{CC}
3	Channel A
4	Channel B
5	GND
6	Motor –

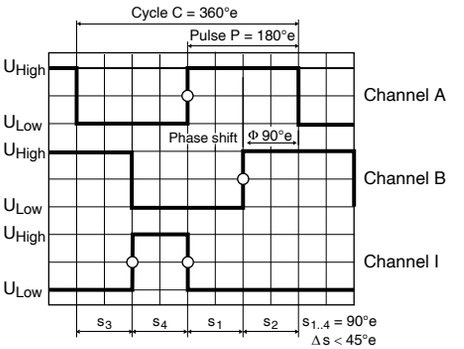
Connection example



Encoder 16 RIO 1024–32768 CPT, 3 Channels, with Line Driver RS 422



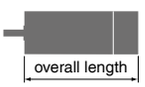


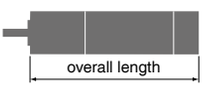


Direction of rotation cw (definition cw p. 68)

Stock program
Standard program
Special program (on request)

Part Numbers	575826	575827	575828	575829	575830
Type (provisional)					
Counts per turn	1024	4096	8192	16384	32768
Number of channels	3	3	3	3	3
Max. operating frequency (kHz)	780	3125	3125	3125	3125
Max. speed (rpm)	40000	40000	20000	10000	5000
Phase shift Φ (°e)	90+/-5	90+/-10	90+/-15	90+/-30	90+/-45
Index pulse width (°e)	90+/-5	90+/-10	90+/-15	90+/-30	90+/-45





maxon Modular System

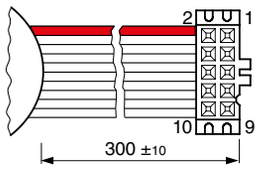
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / • see Gearhead				
EC-4pole 22, 90 W	247					59.3	59.3	59.3	59.3	59.3
EC-4pole 22, 90 W	247	GP 22, 2.0 - 3.4 Nm	378			•	•	•	•	•
EC-4pole 22, 90 W	247	GP 32, 1.0 - 6.0 Nm	388			•	•	•	•	•
EC-4pole 22, 90 W	247	GP 32 S	416-421			•	•	•	•	•
EC-4pole 22, 120 W	248					76.7	76.7	76.7	76.7	76.7
EC-4pole 22, 120 W	248	GP 22, 2.0 - 3.4 Nm	378			•	•	•	•	•
EC-4pole 22, 120 W	248	GP 32, 1.0 - 6.0 Nm	388			•	•	•	•	•
EC-4pole 22, 120 W	248	GP 32 S	416-421			•	•	•	•	•
EC-4pole 30, 100 W	249					59.4	59.4	59.4	59.4	59.4
EC-4pole 30, 100 W	249	GP 32, 4.0 - 8.0 Nm	391			•	•	•	•	•
EC-4pole 30, 100 W	249	GP 42, 3.0 - 15.0 Nm	397			•	•	•	•	•
EC-4pole 30, 100 W	249			AB 20	516	95.8	95.8	95.8	95.8	95.8
EC-4pole 30, 100 W	249	GP 32, 4.0 - 8.0 Nm	391	AB 20	516	•	•	•	•	•
EC-4pole 30, 100 W	249	GP 42, 3.0 - 15.0 Nm	397	AB 20	516	•	•	•	•	•
EC-4pole 30, 200 W	251					76.4	76.4	76.4	76.4	76.4
EC-4pole 30, 200 W	251	GP 32, 4.0 - 8.0 Nm	391			•	•	•	•	•
EC-4pole 30, 200 W	251	GP 42, 3.0 - 15.0 Nm	397			•	•	•	•	•
EC-4pole 30, 200 W	251			AB 20	516	112.8	112.8	112.8	112.8	112.8
EC-4pole 30, 200 W	251	GP 32, 4.0 - 8.0 Nm	391	AB 20	516	•	•	•	•	•
EC-4pole 30, 200 W	251	GP 42, 3.0 - 15.0 Nm	397	AB 20	516	•	•	•	•	•
EC-i 30, 30 W	258					52.2	52.2	52.2	52.2	52.2
EC-i 30, 30 W	258	GP 32, 1.0 - 6.0 Nm	388			•	•	•	•	•
EC-i 30, 30 W	258	GP 32 S	416-421			•	•	•	•	•
EC-i 30, 45 W	259					52.2	52.2	52.2	52.2	52.2
EC-i 30, 45 W	259	GP 32, 1.0 - 6.0 Nm	388			•	•	•	•	•
EC-i 30, 45 W	259	GP 32 S	416-421			•	•	•	•	•

Technical Data

Supply voltage V_{CC}	5 V ± 10%
Typical current draw	50 mA
Output signal	EIA Standard RS 422
Operating temperature range	-40...+100 °C
Moment of inertia of code wheel	≤ 1.2 gcm²
Output current per channel	± 20 mA
Min. state duration s	40 ns
Signal rise and fall times (typically, at C_L = 200 pF, R_L = 100 Ω)	5 ns

The index signal I is synchronized with channel A or B.

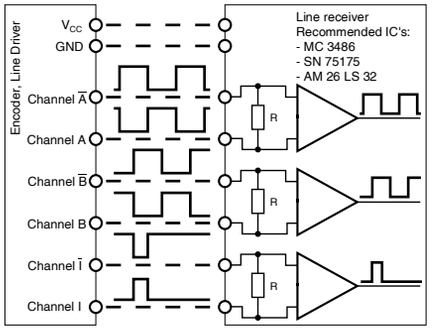
Pin Allocation



1 N.C.
2 V_{CC}
3 GND
4 N.C.
5 Channel $\overline{A}$
6 Channel A
7 Channel $\overline{B}$
8 Channel B
9 Channel $\overline{I}$ (Index)
10 Channel I (Index)

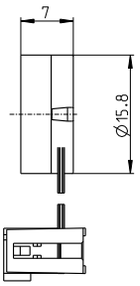
DIN Connector 41651/
EN 60603-13
flat band cable AWG 28

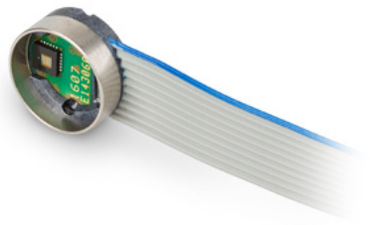
Connection example

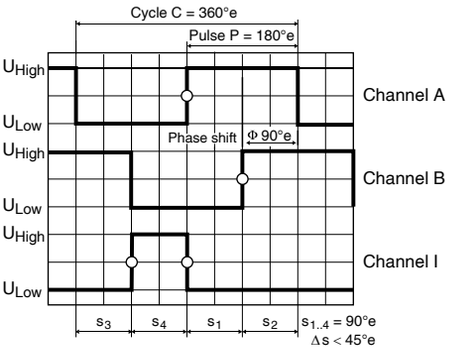


Opt. terminal resistance R = typical 120 Ω

Encoder 16 RIO 1024–32768 CPT, 3 Channels, with Line Driver RS 422



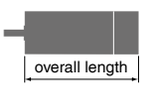


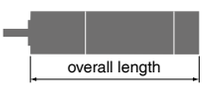


Direction of rotation cw (definition cw p. 68)

Stock program
Standard program
Special program (on request)

Part Numbers	575826	575827	575828	575829	575830
Type (provisional)					
Counts per turn	1024	4096	8192	16384	32768
Number of channels	3	3	3	3	3
Max. operating frequency (kHz)	780	3125	3125	3125	3125
Max. speed (rpm)	40000	40000	20000	10000	5000
Phase shift Φ (°e)	90+/-5	90+/-10	90+/-15	90+/-30	90+/-45
Index pulse width (°e)	90+/-5	90+/-10	90+/-15	90+/-30	90+/-45



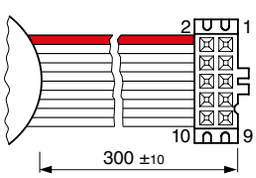


maxon Modular System						**Overall length [mm] / ● see Gearhead**				
+ Motor	Page	**+ Gearhead**	Page	**+ Brake**	Page					
EC-i 30, 50 W	260					74.2	74.2	74.2	74.2	74.2
EC-i 30, 50 W	260	GP 32, 1.0 - 6.0 Nm	388			●	●	●	●	●
EC-i 30, 50 W	260	GP 32 S	416-421			●	●	●	●	●
EC-i 30, 75 W	261					74.2	74.2	74.2	74.2	74.2
EC-i 30, 75 W	261	GP 32, 1.0 - 6.0 Nm	388			●	●	●	●	●
EC-i 30, 75 W	261	GP 32 S	416-421			●	●	●	●	●
EC-i 40, 50 W	262-263					40.5	40.5	40.5	40.5	40.5
EC-i 40, 50 W	262	GP 32, 1.0 - 6.0 Nm	388			●	●	●	●	●
EC-i 40, 50 W	262	GP 32 S	416-421			●	●	●	●	●
EC-i 40, 50 W	262-263	GP 42, 3.0 - 15.0 Nm	396			●	●	●	●	●
EC-i 40, 70 W	264-265					50.5	50.5	50.5	50.5	50.5
EC-i 40, 70 W	264	GP 32, 1.0 - 6.0 Nm	388			●	●	●	●	●
EC-i 40, 70 W	264	GP 32 S	416-421			●	●	●	●	●
EC-i 40, 70 W	264-265	GP 42, 3.0 - 15.0 Nm	396			●	●	●	●	●
EC-i 40, 100 W	266					70.5	70.5	70.5	70.5	70.5
EC-i 40, 100 W	266	GP 42, 3.0 - 15.0 Nm	396			●	●	●	●	●
EC-i 40, 130 W	267					105.3	105.3	105.3	105.3	105.3
EC-i 40, 130 W	267	GP 42, 3.0 - 15.0 Nm	396			●	●			
EC-i 52, 180 W	268					96.5	96.5	96.5	96.5	96.5
EC-i 52, 180 W	268	GP 52, 4.0 - 30.0 Nm	401			●	●	●	●	●
EC-i 52, 200 W	269					126.5	126.5	126.5	126.5	126.5
EC-i 52, 200 W	269	GP 52, 4.0 - 30.0 Nm	401			●	●	●	●	●
EC-i 52, 250 W	270					96.5	96.5	96.5	96.5	96.5
EC-i 52, 420 W	271					96.5	96.5	96.5	96.5	96.5

Technical Data	
Supply voltage V_{CC}	5 V ± 10%
Typical current draw	50 mA
Output signal	EIA Standard RS 422
Operating temperature range	-40...+100 °C
Moment of inertia of code wheel	≤ 1.2 gcm²
Output current per channel	± 20 mA
Min. state duration s	40 ns
Signal rise and fall times (typically, at C_L = 200 pF, R_L = 100 Ω)	5 ns

The index signal I is synchronized with channel A or B.

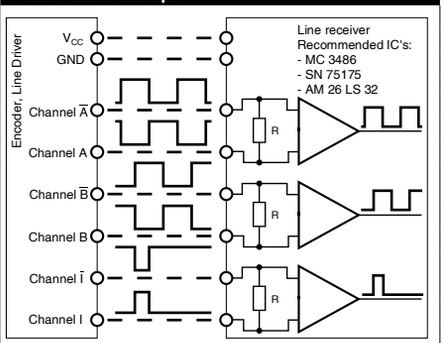
Pin Allocation



1 N.C.
2 V_{CC}
3 GND
4 N.C.
5 Channel $\overline{A}$
6 Channel A
7 Channel $\overline{B}$
8 Channel B
9 Channel $\overline{I}$ (Index)
10 Channel I (Index)

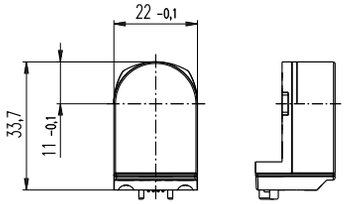
DIN Connector 41651/
EN 60603-13
flat band cable AWG 28

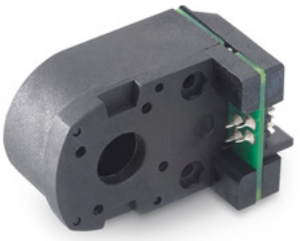
Connection example

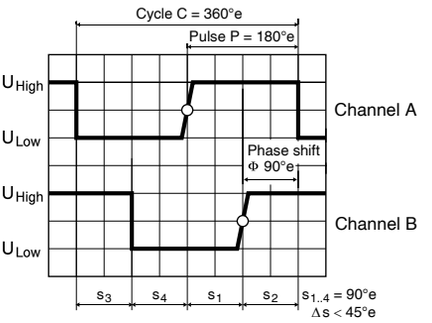


Opt. terminal resistance R = typical 120 Ω

Encoder Enc 22 100 CPT, 2 Channels



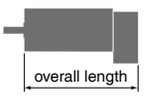


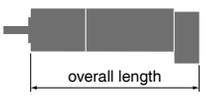


Direction of rotation cw (definition cw p. 68)

Stock program
Standard program
Special program (on request)

Part Numbers	103935	110520	110521
Type			
Counts per turn	100	100	100
Number of channels	2	2	2
Max. operating frequency (kHz)	20	20	20
Max. speed (rpm)	12000	12000	12000
Shaft diameter (mm)	3	2	3





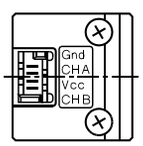
maxon Modular System

+ Motor	Page	+ Gearhead	Page	Overall length [mm] / ● see Gearhead		
RE 25	134/136			68.6		
RE 25	134/136	GP 26, 0.75 - 4.5 Nm	381	●		
RE 25	134/136	GP 32, 0.75 - 4.5 Nm	383	●		
RE 25	134/136	GP 32, 0.75 - 4.5 Nm	384	●		
RE 25	134/136	GP 32, 1.0 - 6.0 Nm	387	●		
RE 25	134/136	GP 32 S	416-421	●		
A-max 19, 1.5 W	154				43.3	
A-max 19, 1.5 W	154	GP 19, 0.1 - 0.3 Nm	371		●	
A-max 19, 1.5 W	154	GP 22, 0.1 - 2.0 Nm	374/376		●	
A-max 19, 1.5 W	154	GS 24, 0.1 Nm	380		●	
A-max 19, 1.5 W	154	GP 22 S	414/415		●	
A-max 19, 2.5 W	156				45.9	
A-max 19, 2.5 W	156	GP 19, 0.1 - 0.3 Nm	371		●	
A-max 19, 2.5 W	156	GP 22, 0.1 - 2.0 Nm	374/376		●	
A-max 19, 2.5 W	156	GS 24, 0.1 Nm	380		●	
A-max 19, 2.5 W	156	GP 22 S	414/415		●	
A-max 22	158/160				46.3	
A-max 22	158/160	GP 22, 0.1 - 0.3 Nm	372		●	
A-max 22	158/160	GP 22, 0.2 - 0.6 Nm	373		●	
A-max 22	158/160	GP 22, 0.1 - 2.0 Nm	372-376		●	
A-max 22	158/160	GS 24, 0.1 Nm	380		●	
A-max 22	158/160	GP 22 S	414/415		●	
A-max 26	161-164					59.1
A-max 26	161-164	GP 26, 0.75 - 4.5 Nm	381			●
A-max 26	161-164	GS 30, 0.07 - 0.2 Nm	382			●
A-max 26	161-164	GP 32, 0.75 - 4.5 Nm	383			●
A-max 26	161-164	GP 32, 0.75 - 4.5 Nm	384			●
A-max 26	161-164	GP 32, 1.0 - 6.0 Nm	388			●
A-max 26	161-164	GS 38, 0.1 - 0.6 Nm	395			●
A-max 26	161-164	GP 32 S	416-421			●

Technical Data

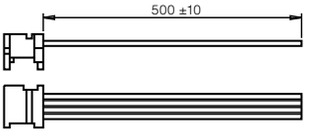
Supply voltage V_{CC}	5 V ± 10%
Typical current draw	18 mA
Output signal	TTL compatible
Phase shift Φ	90°e ± 45°e
Signal rise time (typically, at C_L = 25 pF, R_L = 11 kΩ, 25 °C)	200 ns
Signal fall time (typically, at C_L = 25 pF, R_L = 11 kΩ, 25 °C)	50 ns
Operating temperature range	-20...+85 °C
Moment of inertia of code wheel	≤ 0.05 gcm²
Output current per channel	min. -1 mA, max. 5 mA

Pin Allocation

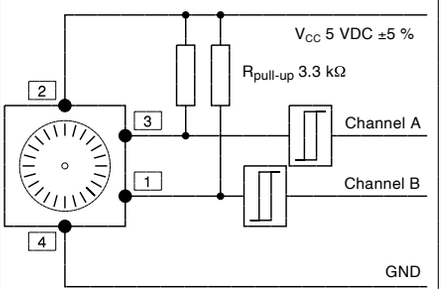


Micromodule contact strip
Type Lumberg MICS 4
Pin 4 GND
Pin 3 Channel A
Pin 2 V_{CC}
Pin 1 Channel B
recommended connectors:
Micromodule connector
Type Lumberg MICA 4

Order number for connector with cable: **3419.506**

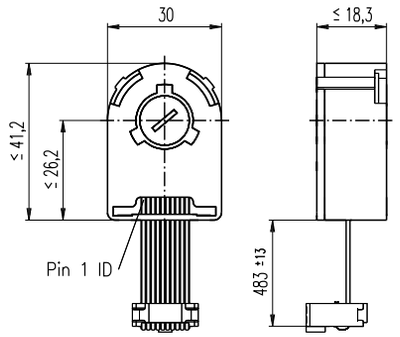


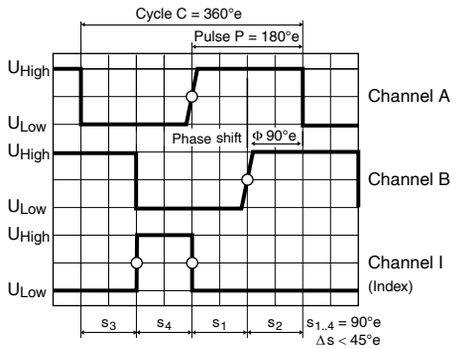
Connection example



Ambient temperature range ϑ_U = 22 - 25 °C

Encoder AEDL 5810 1024–5000 CPT, 3 Channels, with Line Driver RS 422





Direction of rotation cw (definition cw p. 68)

Stock program
Standard program
Special program (on request)

Type	Part Numbers							
	516205	516206	516207	516208	516209	533330	X drives	X drives
Counts per turn	1024	5000	1024	5000	5000	5000	1024	5000
Number of channels	3	3	3	3	3	3	3	3
Max. operating frequency (kHz)	250	1000	250	1000	1000	1000	250	1000
Max. speed (rpm)	14000	12000	14000	12000	12000	12000	14000	12000
Shaft diameter (mm)	3	3	4	4	6	8	2–4	2–4
Phase shift Φ (°e)	90 ± 25	90 ± 45	90 ± 25	90 ± 45	90 ± 45	90 ± 45	90 ± 25	90 ± 45

maxon Modular System

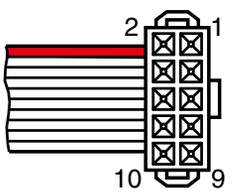
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / • see Gearhead			
EC-4pole 22, 90 W	247					70.1	70.1		
EC-4pole 22, 90 W	247	GP 22/GP 32	378/388			•	•		
EC-4pole 22, 90 W	247	GP 32 S	416-421			•	•		
EC-4pole 22, 120 W	248					87.5	87.5		
EC-4pole 22, 120 W	248	GP 22/GP 32	378/388			•	•		
EC-4pole 22, 120 W	248	GP 32 S	416-421			•	•		
EC-4pole 30, 100 W	249							67.6	67.6
EC-4pole 30, 100 W	249	GP 32, 4.0 - 8.0 Nm	391					•	•
EC-4pole 30, 100 W	249	GP 42, 3.0 - 15.0 Nm	397					•	•
EC-4pole 30, 100 W	249			AB 20	516			104.0	104.0
EC-4pole 30, 100 W	249	GP 32, 4.0 - 8.0 Nm	391	AB 20	516			•	•
EC-4pole 30, 100 W	249	GP 42, 3.0 - 15.0 Nm	397	AB 20	516			•	•
EC-4pole 30, 200 W	251							84.6	84.6
EC-4pole 30, 200 W	251	GP 32, 4.0 - 8.0 Nm	391					•	•
EC-4pole 30, 200 W	251	GP 42, 3.0 - 15.0 Nm	397					•	•
EC-4pole 30, 200 W	251			AB 20	516			121.0	121.0
EC-4pole 30, 200 W	251	GP 32, 4.0 - 8.0 Nm	391	AB 20	516			•	•
EC-4pole 30, 200 W	251	GP 42, 3.0 - 15.0 Nm	397	AB 20	516			•	•
EC-i 30, 30 W	258							62.7	62.7
EC-i 30, 30 W	258	GP 32, 1.0 - 6.0 Nm	388					•	•
EC-i 30, 30 W	258	GP 32 S	416-421					•	•
EC-i 30, 45 W	259							62.7	62.7
EC-i 30, 45 W	259	GP 32, 1.0 - 6.0 Nm	389					•	•
EC-i 30, 45 W	259	GP 32 S	416-421					•	•
EC-i 30, 50 W	260							84.7	84.7
EC-i 30, 50 W	260	GP 32, 1.0 - 6.0 Nm	389					•	•
EC-i 30, 50 W	260	GP 32 S	416-421					•	•
EC-i 30, 75 W	261							84.7	84.7
EC-i 30, 75 W	261	GP 32, 1.0 - 6.0 Nm	389					•	•
EC-i 30, 75 W	261	GP 32 S	416-421					•	•

Technical Data

Supply voltage V_{CC}	5 V ± 10%
Typical current draw	30 mA
Output signal	EIA Standard RS 422
driver used:	AM26C31QD
Signal rise time (typically, at C_L = 100 pF, 25 °C)	10 ns
Signal fall time (typically, at C_L = 100 pF, 25 °C)	10 ns
Index pulse width	90°e
Operating temperature range	-40...+85 °C
Moment of inertia of code wheel	≤ 0.6 gcm²
Output current per channel	± 20 mA

The index signal I is synchronized with channel A or B.

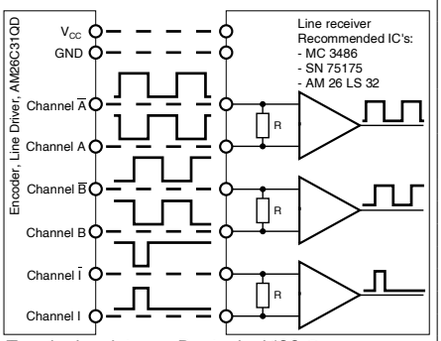
Pin Allocation



1 N.C.
2 V_{CC}
3 GND
4 N.C.
5 Channel $\overline{A}$
6 Channel A
7 Channel $\overline{B}$
8 Channel B
9 Channel $\overline{I}$ (Index)
10 Channel I (Index)

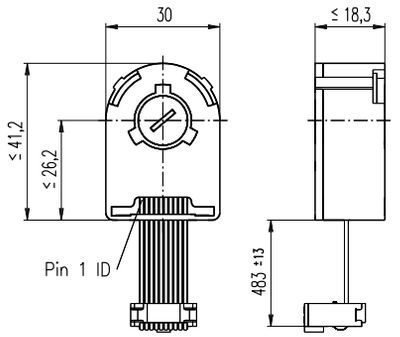
Pin type DIN 41651/
EN 60603-13
flat band cable AWG 28

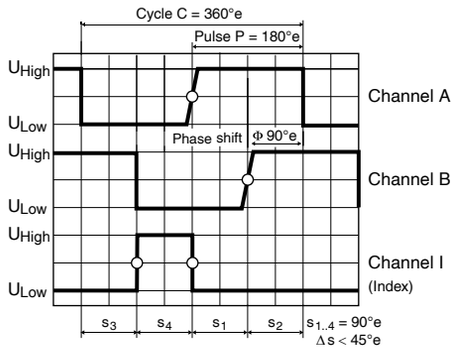
Connection example



Terminal resistance R = typical 120 Ω

Encoder AEDL 5810 1024–5000 CPT, 3 Channels, with Line Driver RS 422





Direction of rotation cw (definition cw p. 68)

Stock program
Standard program
Special program (on request)

Part Numbers	516205	516206	516207	516208	516209	533330	X drives	X drives
Type								
Counts per turn	1024	5000	1024	5000	5000	5000	1024	5000
Number of channels	3	3	3	3	3	3	3	3
Max. operating frequency (kHz)	250	1000	250	1000	1000	1000	250	1000
Max. speed (rpm)	14000	12000	14000	12000	12000	12000	14000	12000
Shaft diameter (mm)	3	3	4	4	6	8	2–4	2–4
Phase shift Φ (°e)	90 ± 25	90 ± 45	90 ± 25	90 ± 45	90 ± 45	90 ± 45	90 ± 25	90 ± 45

maxon Modular System

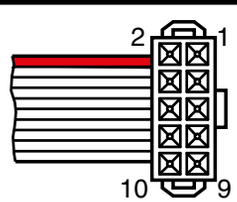
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead							
EC-i 40, 50 W	262-263									49.0			
EC-i 40, 50 W	262	GP 32, 1.0 - 6.0 Nm	389							●			
EC-i 40, 50 W	262	GP 32 S	416-421							●			
EC-i 40, 50 W	262-263	GP 42, 3.0 - 15.0 Nm	397							●			
EC-i 40, 70 W	264/265									59.0			
EC-i 40, 70 W	264	GP 32, 1.0 - 6.0 Nm	389							●			
EC-i 40, 70 W	264	GP 32 S	416-421							●			
EC-i 40, 70 W	264/265	GP 42, 3.0 - 15.0 Nm	398							●			
EC-i 40, 100 W	266									79.0			
EC-i 40, 100 W	266	GP 42, 3.0 - 15.0 Nm	397							●			
EC-i 40, 130 W	267									113.8			
EC-i 40, 130 W	267	GP 42, 3.0 - 15.0 Nm	397							●			
EC-i 52, 180 W	268										100.7		
EC-i 52, 180 W	268	GP 52, 4.0 - 30.0 Nm	402								●		
EC-i 52, 200 W	269										130.7		online
EC-i 52, 200 W	269	GP 52, 4.0 - 30.0 Nm	402								●		online
DCX 22 S	89-90												online
DCX 22 L	91-92												online
DCX 26 L	93-94												online
DCX 32 L	95												
DCX 35 L	96												

Technical Data

Supply voltage V_{CC}	5 V ± 10%
Typical current draw	30 mA
Output signal	EIA Standard RS 422
driver used:	AM26C31QD
Signal rise time (typically, at C_L = 100 pF, 25 °C)	10 ns
Signal fall time (typically, at C_L = 100 pF, 25 °C)	10 ns
Index pulse width	90°e
Operating temperature range	-40...+85 °C
Moment of inertia of code wheel	≤ 0.6 gcm²
Output current per channel	± 20 mA

The index signal I is synchronized with channel A or B.

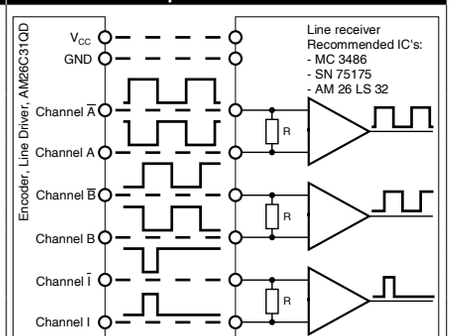
Pin Allocation



1	N.C.
2	V_{CC}
3	GND
4	N.C.
5	Channel $\overline{A}$
6	Channel A
7	Channel $\overline{B}$
8	Channel B
9	Channel $\overline{I}$ (Index)
10	Channel I (Index)

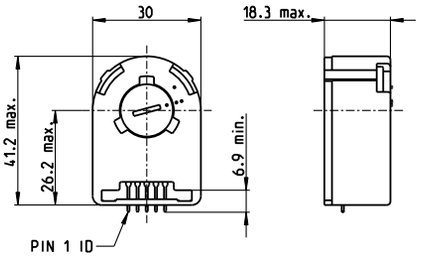
Pin type DIN 41651/
EN 60603-13
flat band cable AWG 28

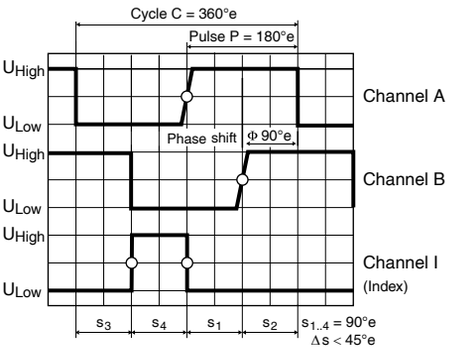
Connection example



Terminal resistance R = typical 120 Ω

Encoder HEDS 5540 500 CPT, 3 Channels



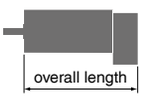


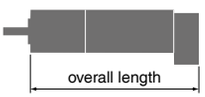
Direction of rotation cw (definition cw p. 68)

sensor

Stock program
Standard program
Special program (on request)

Type	Part Numbers 110511	110513	110515	110517	X drives
Counts per turn	500	500	500	500	500
Number of channels	3	3	3	3	3
Max. operating frequency (kHz)	100	100	100	100	100
Max. speed (rpm)	12000	12000	12000	12000	12000
Shaft diameter (mm)	3	4	6	8	2-4





maxon Modular System

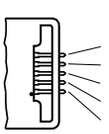
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead				
RE 25	134/136					75.3				
RE 25	134/136	GP 26, 0.75 - 4.5 Nm	381			●				
RE 25	134/136	GP 32, 0.75 - 6.0 Nm	383-387			●				
RE 25	134/136	KD 32, 1.0 - 4.5 Nm	394			●				
RE 25	134/136	GP 32 S	416-421			●				
RE 25, 20 W	136			AB 28	519	105.8				
RE 25, 20 W	136	GP 26, 0.75 - 4.5 Nm	381	AB 28	519	●				
RE 25, 20 W	136	GP 32, 0.75 - 6.0 Nm	383-387	AB 28	519	●				
RE 25, 20 W	136	KD 32, 1.0 - 4.5 Nm	394	AB 28	519	●				
RE 25, 20 W	136	GP 32 S	416-421	AB 28	519	●				
RE 30, 15 W	137					88.8				
RE 30, 15 W	137	GP 32, 0.75 - 4.5 Nm	385			●				
RE 30, 60 W	138					88.8				
RE 30, 60 W	138	GP 32, 0.75 - 6.0 Nm	383-390			●				
RE 30, 60 W	138	KD 32, 1.0 - 4.5 Nm	394			●				
RE 30, 60 W	138	GP 32 S	416-421			●				
RE 35, 90 W	139						91.7			
RE 35, 90 W	139	GP 32, 0.75 - 8.0 Nm	383-391				●			
RE 35, 90 W	139	GP 42, 3.0 - 15 Nm	396				●			
RE 35, 90 W	139	GP 32 S	416-421				●			
RE 35, 90 W	139			AB 28	519	124.3				
RE 35, 90 W	139	GP 32, 0.75 - 8.0 Nm	383-391	AB 28	519	●				
RE 35, 90 W	139	GP 42, 3.0 - 15 Nm	396	AB 28	519	●				
RE 35, 90 W	139	GP 32 S	416-421	AB 28	519	●				
RE 40, 25 W	140						91.7			
RE 40, 150 W	141						●			
RE 40, 150 W	141	GP 42, 3.0 - 15 Nm	396				●			
RE 40, 150 W	141	GP 52, 4.0 - 30 Nm	401				●			
RE 40, 150 W	141			AB 28	519	124.3				
RE 40, 150 W	141	GP 42, 3.0 - 15 Nm	396	AB 28	519	●				
RE 40, 150 W	141	GP 52, 4.0 - 30 Nm	401	AB 28	519	●				online
DCX 22 S	89-90									online
DCX 22 L	91-92									online
DCX 26 L	93-94									online
DCX 32 L	95									online

Technical Data

Supply voltage V_{CC}	5 V ± 10%
Typical current draw	55 mA
Output signal	TTL compatible
Phase shift Φ	90°e ± 45°e
Signal rise time (typically, at C_L = 25 pF, R_L = 2.7 kΩ, 25 °C)	180 ns
Signal fall time (typically, at C_L = 25 pF, R_L = 2.7 kΩ, 25 °C)	40 ns
Index pulse width (nominal)	90°e
Operating temperature range	-40...+100 °C
Moment of inertia of code wheel	≤ 0.6 gcm²
Max. angular acceleration	250 000 rad s^{-2}
Output current per channel	min. -1 mA, max. 5 mA

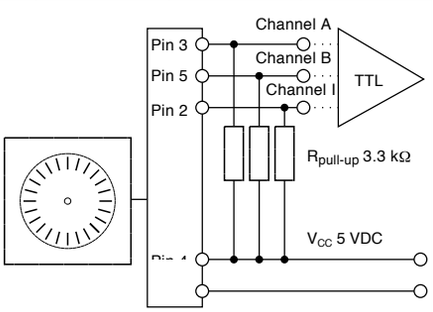
The index signal I is synchronized with channel A or B.

Pin Allocation



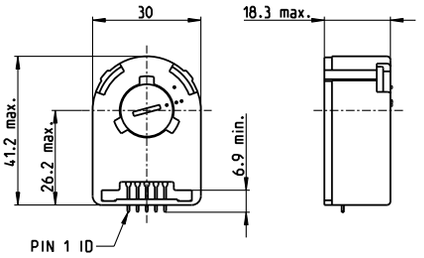
Encoder	Description	Pin no. from 3409.506
Pin 5	Channel B	1
Pin 4	V_{CC}	2
Pin 3	Channel A	3
Pin 2	Channel I	4
Pin 1	GND	5

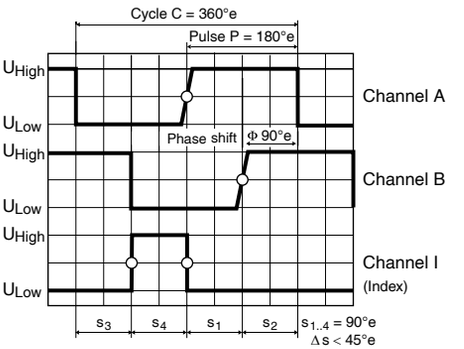
Connection example



Ambient temperature range ϑ_U = 25 °C

Encoder HEDS 5540 500 CPT, 3 Channels





Direction of rotation cw (definition cw p. 68)

Stock program
Standard program
Special program (on request)

	Part Numbers				
	110511	110513	110515	110517	X drives
Type					
Counts per turn	500	500	500	500	500
Number of channels	3	3	3	3	3
Max. operating frequency (kHz)	100	100	100	100	100
Max. speed (rpm)	12000	12000	12000	12000	12000
Shaft diameter (mm)	3	4	6	8	2-4

maxon Modular System

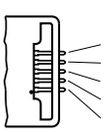
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / • see Gearhead				
RE 25, 20 W	135					63.8				
RE 25, 20 W	135	GP 26, 0.75 - 4.5 Nm	381			•				
RE 25, 20 W	135	GP 32, 0.75 - 4.5 Nm	383			•				
RE 25, 20 W	135	GP 32, 0.75 - 6.0 Nm	384/387			•				
RE 25, 20 W	135	KD 32, 1.0 - 4.5 Nm	394			•				
RE 25, 20 W	135	GP 32 S	416-421			•				
RE 25, 20 W	135			AB 28	519	94.3				
RE 25, 20 W	135	GP 22, 0.5 Nm	375			•				
RE 25, 20 W	135	GP 26, 0.75 - 4.5 Nm	381	AB 28	519	•				
RE 25, 20 W	135	GP 32, 0.75 - 4.5 Nm	383	AB 28	519	•				
RE 25, 20 W	135	GP 32, 0.75 - 6.0 Nm	384/387	AB 28	519	•				
RE 25, 20 W	135	KD 32, 1.0 - 4.5 Nm	394	AB 28	519	•				
RE 25, 20 W	135	GP 32 S	416-421	AB 28	519	•				
RE 50, 200 W	142								128.7	
RE 50, 200 W	142	GP 52, 4 - 30 Nm	401						•	
RE 50, 200 W	142	GP 62, 8 - 50 Nm	403						•	
RE 65, 250 W	143								157.3	
RE 65, 250 W	143	GP 81, 20 - 120 Nm	404						•	
A-max 26	161-164					63.1				
A-max 26	161-164	GP 26, 0.75 - 4.5 Nm	381			•				
A-max 26	161-164	GS 30, 0.07 - 0.2 Nm	382			•				
A-max 26	161-164	GP 32, 0.75 - 4.5 Nm	383			•				
A-max 26	161-164	GP 32, 0.75 - 6.0 Nm	384/387			•				
A-max 26	161-164	GS 38, 0.1 - 0.6 Nm	395			•				
A-max 26	161-164	GP 32 S	416-421			•				
A-max 32	166						82.3			
A-max 32	166	GP 32, 0.75 - 6.0 Nm	383-388				•			
A-max 32	166	GS 38, 0.1 - 0.6 Nm	395				•			
A-max 32	166	GP 32 S	416-421				•			
EC 32, 80 W	228						78.4			
EC 32, 80 W	228	GP 32, 0.75 - 6.0 Nm	383-390				•			
EC 32, 80 W	228	GP 32 S	416-421				•			
EC 40, 170 W	229							103.4		
EC 40, 170 W	229	GP 42, 3.0 - 15 Nm	396					•		
EC 40, 170 W	229	GP 52, 4.0 - 30 Nm	401					•		

Technical Data

Supply voltage V_{CC}	5 V ± 10%
Typical current draw	55 mA
Output signal	TTL compatible
Phase shift Φ	90°e ± 45°e
Signal rise time (typically, at C_L = 25 pF, R_L = 2.7 kΩ, 25 °C)	180 ns
Signal fall time (typically, at C_L = 25 pF, R_L = 2.7 kΩ, 25 °C)	40 ns
Index pulse width	90°e
Operating temperature range	-40...+100 °C
Moment of inertia of code wheel	≤ 0.6 gcm²
Max. angular acceleration	250000 rad s⁻²
Output current per channel	min. -1 mA, max. 5 mA

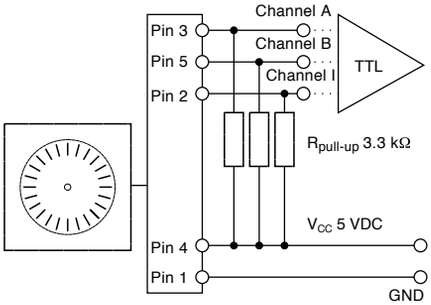
The index signal I is synchronized with channel A or B.

Pin Allocation



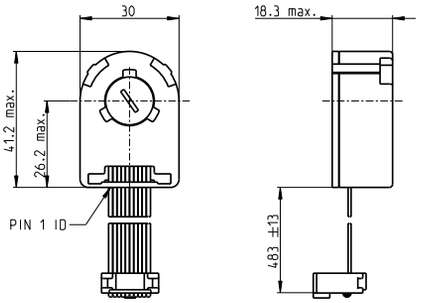
Encoder	Description	Pin no. from 3409.506
Pin 5	Channel B	1
Pin 4	V_{CC}	2
Pin 3	Channel A	3
Pin 2	Channel I	4
Pin 1	GND	5

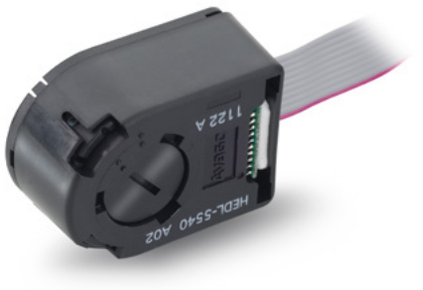
Connection example

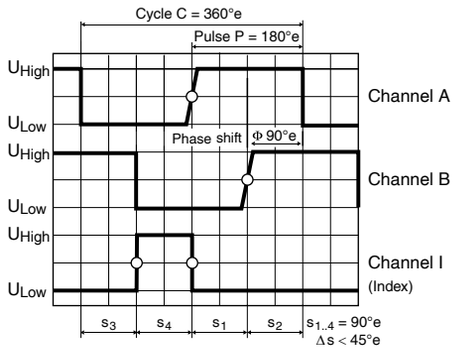


Ambient temperature range ϑ_U = 25 °C

Encoder HEDL 5540 500 CPT, 3 Channels, with Line Driver RS 422







Direction of rotation cw (definition cw p. 68)

Stock program
Standard program
Special program (on request)

Type	Part Numbers 110512	110514	110516	110518	X drives
Counts per turn	500	500	500	500	500
Number of channels	3	3	3	3	3
Max. operating frequency (kHz)	100	100	100	100	100
Max. speed (rpm)	12000	12000	12000	12000	12000
Shaft diameter (mm)	3	4	6	8	2–4

maxon Modular System

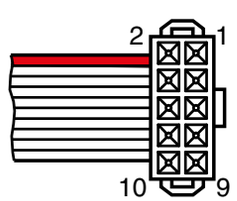
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / • see Gearhead				
RE 25	134/136					75.3				
RE 25	134/136	GP 26/GP 32	381/383			•				
RE 25	134/136	KD 32, 1.0 - 4.5 Nm	394			•				
RE 25	134/136	GP 32, 0.75 - 6.0 Nm	384/387			•				
RE 25	134/136	GP 32 S	416-421			•				
RE 25, 20 W	135					63.8				
RE 25, 20 W	135	GP 22, 0.5 Nm	375			•				
RE 25, 20 W	135	GP 26/GP 32	381/383			•				
RE 25, 20 W	135	KD 32, 1.0 - 4.5 Nm	394			•				
RE 25, 20 W	135	GP 32, 0.75 - 6.0 Nm	384/387			•				
RE 25, 20 W	135	GP 32 S	416-421			•				
RE 25, 20 W	135			AB 28	519	94.3				
RE 25, 20 W	135	GP 26/GP 32	381/383	AB 28	519	•				
RE 25, 20 W	135	KD 32, 1.0 - 4.5 Nm	394	AB 28	519	•				
RE 25, 20 W	135	GP 32, 0.75 - 6.0 Nm	384/387	AB 28	519	•				
RE 25, 20 W	135	GP 32 S	416-421	AB 28	519	•				
RE 25, 20 W	136			AB 28	519	105.8				
RE 25, 20 W	136	GP 26/GP 32	381/383	AB 28	519	•				
RE 25, 20 W	136	KD 32, 1.0 - 4.5 Nm	394	AB 28	519	•				
RE 25, 20 W	136	GP 32, 0.75 - 6.0 Nm	384/387	AB 28	519	•				
RE 25, 20 W	136	GP 32 S	416-421	AB 28	519	•				
RE 30, 15 W	137					88.8				
RE 30, 15 W	137	GP 32, 0.75 - 4.5 Nm	385			•				
RE 30, 60 W	138					88.8				
RE 30, 60 W	138	GP 32, 0.75 - 6.0 Nm	383-390			•				
RE 30, 60 W	138	KD 32, 1.0 - 4.5 Nm	394			•				
RE 30, 60 W	138	GP 32 S	416-421			•				
RE 35, 90 W	139						91.7			
RE 35, 90 W	139	GP 32, 0.75 - 8.0 Nm	383-391				•			
RE 35, 90 W	139	GP 42, 3.0 - 15.0 Nm	396				•			
RE 35, 90 W	139	GP 32 S	416-421				•			
RE 35, 90 W	139			AB 28	519	124.3				
RE 35, 90 W	139	GP 32, 0.75 - 8.0 Nm	383-391	AB 28	519	•				
RE 35, 90 W	139	GP 42, 3.0 - 15.0 Nm	396	AB 28	519	•				
RE 35, 90 W	139	GP 32 S	417-421	AB 28	519	•				

Technical Data

Supply voltage V_{CC}	5 V ± 10%
Typical current draw	55 mA
Output signal	EIA Standard RS 422
driver used:	DS26LS31
Phase shift Φ	90°e ± 45°e
Signal rise time (typically, at C_L = 25 pF, R_L = 2.7 kΩ, 25 °C)	180 ns
Signal fall time (typically, at C_L = 25 pF, R_L = 2.7 kΩ, 25 °C)	40 ns
Index pulse width	90°e
Operating temperature range	-40...+100 °C
Moment of inertia of code wheel	≤ 0.6 gcm²
Max. angular acceleration	250 000 rad s⁻²
Output current per channel	± 20 mA

The index signal I is synchronized with channel A or B.

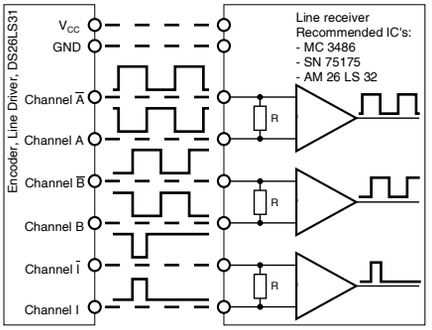
Pin Allocation



1 N.C.
2 V_{CC}
3 GND
4 N.C.
5 Channel $\overline{A}$
6 Channel A
7 Channel $\overline{B}$
8 Channel B
9 Channel $\overline{I}$ (Index)
10 Channel I (Index)

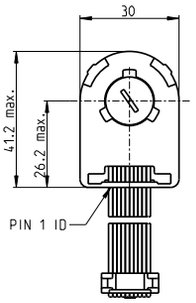
Pin type DIN 41651/
EN 60603-13
flat band cable AWG 28

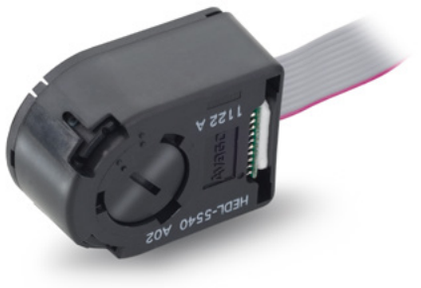
Connection example

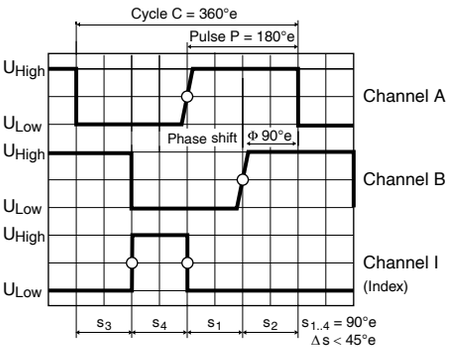


Terminal resistance R = typical 120 Ω

Encoder HEDL 5540 500 CPT, 3 Channels, with Line Driver RS 422



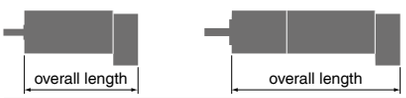




Direction of rotation cw (definition cw p. 68)

Stock program
Standard program
Special program (on request)

Part Numbers	110512	110514	110516	110518	X drives
Type					
Counts per turn	500	500	500	500	500
Number of channels	3	3	3	3	3
Max. operating frequency (kHz)	100	100	100	100	100
Max. speed (rpm)	12000	12000	12000	12000	12000
Shaft diameter (mm)	3	4	6	8	2–4



maxon Modular System

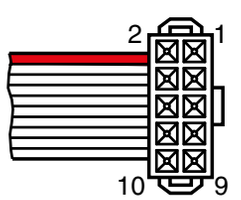
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead				
RE 40, 25 W	140						91.7			
RE 40, 150 W	141						91.7			
RE 40, 150 W	141	GP 42, 3.0 - 15.0 Nm	396				●			
RE 40, 150 W	141	GP 52, 4.0 - 30.0 Nm	401				●			
RE 40, 150 W	141			AB 28	519	124.3				
RE 40, 150 W	141	GP 42, 3.0 - 15.0 Nm	396	AB 28	519	●				
RE 40, 150 W	141	GP 52, 4.0 - 30.0 Nm	401	AB 28	519	●				
RE 50, 200 W	142								128.7	
RE 50, 200 W	142	GP 52, 4.0 - 30.0 Nm	402						●	
RE 50, 200 W	142	GP 62, 8.0 - 50.0 Nm	403						●	
RE 65, 250 W	143								157.3	
RE 65, 250 W	143	GP 81, 20.0 - 120.0 Nm	404						●	
A-max 26	161-164					63.1				
A-max 26	161-164	GP 26, 0.75 - 4.5 Nm	381			●				
A-max 26	161-164	GS 30/GP 32	382/385			●				
A-max 26	161-164	GP 32, 0.75 - 6.0 Nm	384/387			●				
A-max 26	161-164	GS 38, 0.1 - 0.6 Nm	395			●				
A-max 26	161-164	GP 32 S	416-421			●				
A-max 32	166						82.3			
A-max 32	166	GP 32, 0.75 - 6.0 Nm	383-388				●			
A-max 32	166	GS 38, 0.1 - 0.6 Nm	395				●			
A-max 32	166	GP 32 S	416-421				●			
EC 32, 80 W	228						78.4			
EC 32, 80 W	228	GP 32, 0.75 - 6.0 Nm	383-390				●			
EC 32, 80 W	228	GP 32 S	416-421				●			
EC 40, 170 W	229							103.4		
EC 40, 170 W	229	GP 42, 3.0 - 15.0 Nm	396					●		
EC 40, 170 W	229	GP 52, 4.0 - 30.0 Nm	401					●		

Technical Data

Supply voltage V_{CC}	5 V ± 10%
Typical current draw	55 mA
Output signal	EIA Standard RS 422
driver used:	DS26LS31
Phase shift Φ	90°e ± 45°e
Signal rise time (typically, at C_L = 25 pF, R_L = 2.7 kΩ, 25 °C)	180 ns
Signal fall time (typically, at C_L = 25 pF, R_L = 2.7 kΩ, 25 °C)	40 ns
Index pulse width	90°e
Operating temperature range	-40...+100 °C
Moment of inertia of code wheel	≤ 0.6 gcm²
Max. angular acceleration	250000 rad s⁻²
Output current per channel	± 20 mA

The index signal I is synchronized with channel A or B.

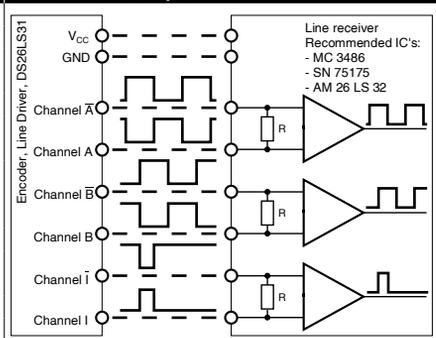
Pin Allocation



1 N.C.
2 V_{CC}
3 GND
4 N.C.
5 Channel $\overline{A}$
6 Channel A
7 Channel $\overline{B}$
8 Channel B
9 Channel $\overline{I}$ (Index)
10 Channel I (Index)

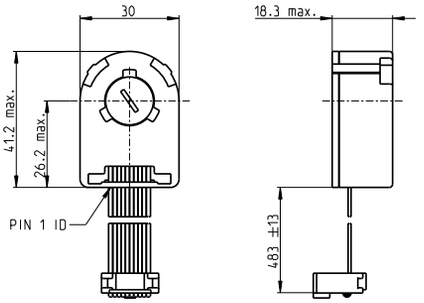
Pin type DIN 41651/
EN 60603-13
flat band cable AWG 28

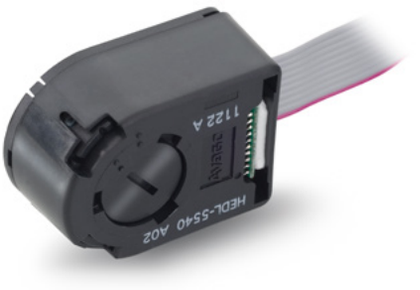
Connection example

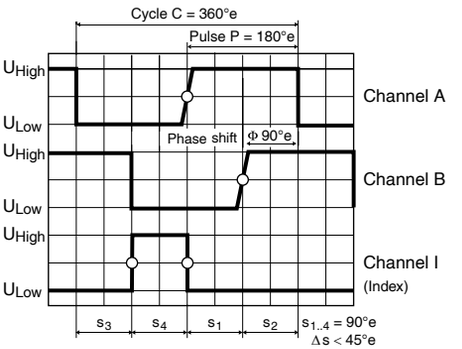


Terminal resistance R = typical 120 Ω

Encoder HEDL 5540 500 CPT, 3 Channels, with Line Driver RS 422





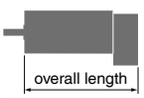


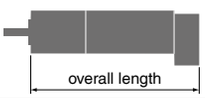
Direction of rotation cw (definition cw p. 68)

sensor

Stock program
Standard program
Special program (on request)

Part Numbers	110512	110514	110516	110518	X drives
Type					
Counts per turn	500	500	500	500	500
Number of channels	3	3	3	3	3
Max. operating frequency (kHz)	100	100	100	100	100
Max. speed (rpm)	12000	12000	12000	12000	12000
Shaft diameter (mm)	3	4	6	8	2–4





maxon Modular System

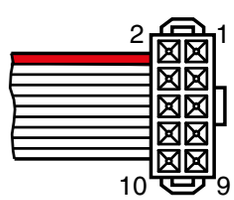
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead				
EC-max 30, 40 W	240					62.6				
EC-max 30, 40 W	240	GP 32, 1.0 - 8.0 Nm	388/391			●				
EC-max 30, 40 W	240	KD 32, 1.0 - 4.5 Nm	394			●				
EC-max 30, 40 W	240	GP 32 S	416-421			●				
EC-max 30, 40 W	240			AB 20	516	98.4				
EC-max 30, 40 W	240	GP 32, 1.0 - 8.0 Nm	388/391	AB 20	516	●				
EC-max 30, 40 W	240	KD 32, 1.0 - 4.5 Nm	394	AB 20	516	●				
EC-max 30, 40 W	240	GP 32 S	416-421	AB 20	516	●				
EC-max 30, 60 W	241					84.6				
EC-max 30, 60 W	241	GP 32, 1.0 - 8.0 Nm	388/391			●				
EC-max 30, 60 W	241	KD 32, 1.0 - 4.5 Nm	394			●				
EC-max 30, 60 W	241	GP 42, 3.0 - 15.0 Nm	397			●				
EC-max 30, 60 W	241			AB 20	516	120.4				
EC-max 30, 60 W	241	GP 32, 1.0 - 8.0 Nm	388/391	AB 20	516	●				
EC-max 30, 60 W	241	KD 32, 1.0 - 4.5 Nm	394	AB 20	516	●				
EC-max 30, 60 W	241	GP 42, 3.0 - 15.0 Nm	397	AB 20	516	●				
EC-max 40, 70 W	242						81.4			
EC-max 40, 70 W	242	GP 42, 3.0 - 15.0 Nm	397				●			
EC-max 40, 70 W	242			AB 28	518		110.7			
EC-max 40, 70 W	242	GP 42, 3.0 - 15.0 Nm	397	AB 28	518		●			
EC-max 40, 120 W	243						111.4			
EC-max 40, 120 W	243	GP 52, 4.0 - 30.0 Nm	402				●			
EC-max 40, 120 W	243			AB 28	518		140.7			
EC-max 40, 120 W	243	GP 52, 4.0 - 30.0 Nm	402	AB 28	518		●			
EC-4pole 22, 90 W	247					70.1				
EC-4pole 22, 90 W	247	GP 22/GP 32	378/388			●				
EC-4pole 22, 90 W	247	GP 32 S	416-421			●				
EC-4pole 22, 120 W	248					87.5				
EC-4pole 22, 120 W	248	GP 22/GP 32	378/388			●				
EC-4pole 22, 120 W	248	GP 32 S	416-421			●				

Technical Data

Supply voltage V_{CC}	5 V ± 10%
Typical current draw	55 mA
Output signal	EIA Standard RS 422
driver used:	DS26LS31
Phase shift Φ	90°e ± 45°e
Signal rise time	
(typically, at C_L = 25 pF, R_L = 2.7 kΩ, 25 °C)	180 ns
Signal fall time	
(typically, at C_L = 25 pF, R_L = 2.7 kΩ, 25 °C)	40 ns
Index pulse width	90°e
Operating temperature range	-40...+100 °C
Moment of inertia of code wheel	≤ 0.6 gcm²
Max. angular acceleration	250 000 rad s⁻²
Output current per channel	± 20 mA

The index signal I is synchronized with channel A or B.

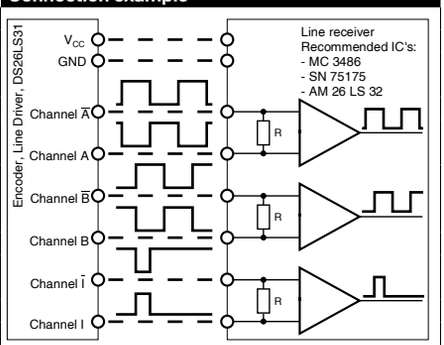
Pin Allocation



1 N.C.
2 V_{CC}
3 GND
4 N.C.
5 Channel $\overline{A}$
6 Channel A
7 Channel $\overline{B}$
8 Channel B
9 Channel $\overline{I}$ (Index)
10 Channel I (Index)

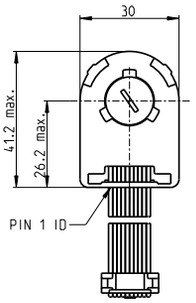
Pin type DIN 41651/
EN 60603-13
flat band cable AWG 28

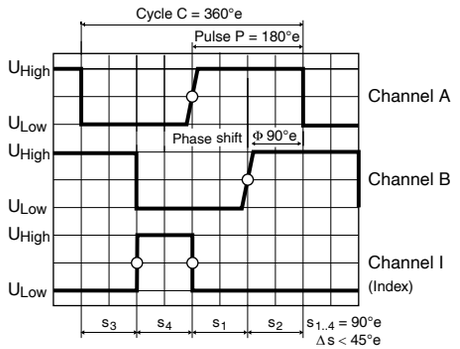
Connection example



Terminal resistance R = typical 120 Ω

Encoder HEDL 5540 500 CPT, 3 Channels, with Line Driver RS 422





Direction of rotation cw (definition cw p. 68)

Stock program
Standard program
Special program (on request)

Part Numbers	110512	110514	110516	110518	X drives
Type					
Counts per turn	500	500	500	500	500
Number of channels	3	3	3	3	3
Max. operating frequency (kHz)	100	100	100	100	100
Max. speed (rpm)	12000	12000	12000	12000	12000
Shaft diameter (mm)	3	4	6	8	2–4

maxon Modular System

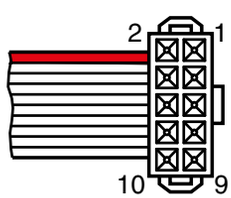
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
EC-4pole 30, 100 W	249					67.6
EC-4pole 30, 100 W	249	GP 32, 4.0 - 8.0 Nm	391			●
EC-4pole 30, 100 W	249	GP 42, 3 - 15 Nm	397			●
EC-4pole 30, 100 W	249			AB 20	516	104.0
EC-4pole 30, 100 W	249	GP 32, 4.0 - 8.0 Nm	391	AB 20	516	●
EC-4pole 30, 100 W	249	GP 42, 3 - 15 Nm	397	AB 20	516	●
EC-4pole 30, 200 W	251					84.6
EC-4pole 30, 200 W	251	GP 32, 4.0 - 8.0 Nm	391			●
EC-4pole 30, 200 W	251	GP 42, 3 - 15 Nm	397			●
EC-4pole 30, 200 W	251			AB 20	516	121.0
EC-4pole 30, 200 W	251	GP 32, 4.0 - 8.0 Nm	391	AB 20	516	●
EC-4pole 30, 200 W	251	GP 42, 3 - 15 Nm	397	AB 20	516	●
EC-i 30, 30 W	258					62.7
EC-i 30, 30 W	258	GP 32, 1.0 - 6.0 Nm	388			●
EC-i 30, 30 W	258	GP 32 S	416-421			●
EC-i 30, 45 W	259					62.7
EC-i 30, 45 W	259	GP 32, 1.0 - 6.0 Nm	389			●
EC-i 30, 45 W	259	GP 32 S	416-421			●
EC-i 30, 50 W	260					84.7
EC-i 30, 50 W	260	GP 32, 1.0 - 6.0 Nm	389			●
EC-i 30, 50 W	260	GP 32 S	416-421			●
EC-i 30, 75 W	261					84.7
EC-i 30, 75 W	261	GP 32, 1.0 - 6.0 Nm	389			●
EC-i 30, 75 W	261	GP 32 S	416-421			●

Technical Data

Supply voltage V_{CC}	5 V ± 10%
Typical current draw	55 mA
Output signal	EIA Standard RS 422
driver used:	DS26LS31
Phase shift Φ	90°e ± 45°e
Signal rise time	
(typically, at C_L = 25 pF, R_L = 2.7 kΩ, 25 °C)	180 ns
Signal fall time	
(typically, at C_L = 25 pF, R_L = 2.7 kΩ, 25 °C)	40 ns
Index pulse width	90°e
Operating temperature range	-40...+100 °C
Moment of inertia of code wheel	≤ 0.6 gcm²
Max. angular acceleration	250000 rad s⁻²
Output current per channel	± 20 mA

The index signal I is synchronized with channel A or B.

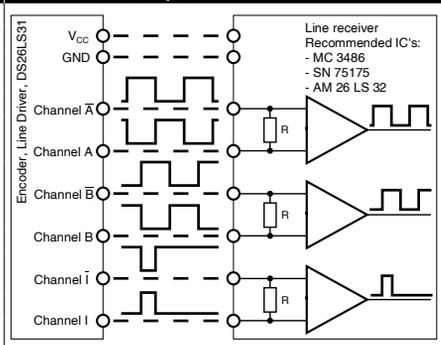
Pin Allocation



1 N.C.
2 V_{CC}
3 GND
4 N.C.
5 Channel $\overline{A}$
6 Channel A
7 Channel $\overline{B}$
8 Channel B
9 Channel $\overline{I}$ (Index)
10 Channel I (Index)

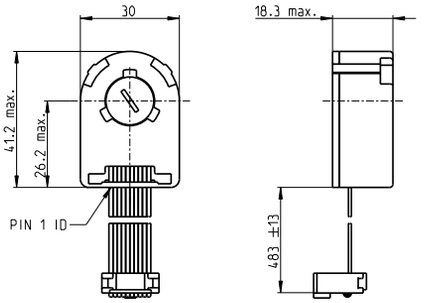
Pin type DIN 41651/
EN 60603-13
flat band cable AWG 28

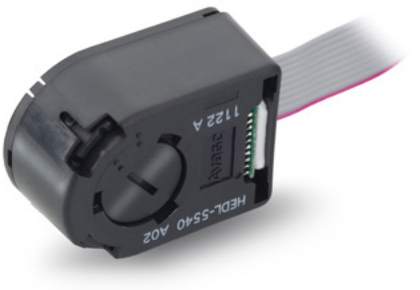
Connection example

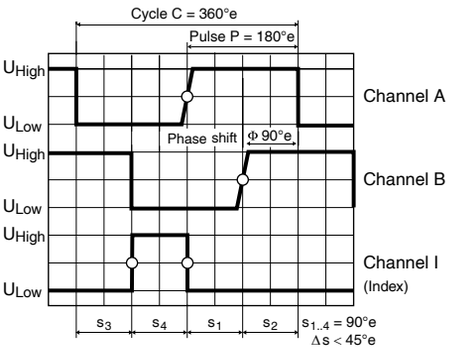


Terminal resistance R = typical 120 Ω

Encoder HEDL 5540 500 CPT, 3 Channels, with Line Driver RS 422



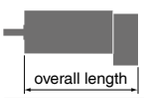


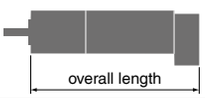


Direction of rotation cw (definition cw p. 68)

Stock program
Standard program
Special program (on request)

	Part Numbers				
Type	110512	110514	**110516**	**110518**	**X drives**
Counts per turn	500	500	500	500	500
Number of channels	3	3	3	3	3
Max. operating frequency (kHz)	100	100	100	100	100
Max. speed (rpm)	12000	12000	12000	12000	12000
Shaft diameter (mm)	3	4	6	8	2–4





maxon Modular System

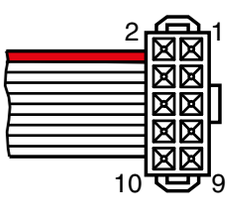
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead			
EC-i 40, 50 W	262/263					49.0			
EC-i 40, 50 W	262	GP 32, 1.0 - 6.0 Nm	388			●			
EC-i 40, 50 W	262/263	GP 42, 3.0 - 15.0 Nm	397			●			
EC-i 40, 50 W	262	GP 32 S	416-421			●			
EC-i 40, 70 W	264/265					59.0			
EC-i 40, 70 W	264	GP 32, 1.0 - 6.0 Nm	388			●			
EC-i 40, 70 W	264/265	GP 42, 3.0 - 15.0 Nm	397			●			
EC-i 40, 70 W	264	GP 32 S	416-421			●			
EC-i 40, 100 W	266					79.0			
EC-i 40, 100 W	266	GP 42, 3.0 - 15.0 Nm	397			●			
EC-i 40, 130 W	267					113.8			
EC-i 40, 130 W	267	GP 42, 3.0 - 15.0 Nm	397			●			
EC-i 52, 180 W	268						100.7		
EC-i 52, 180 W	268	GP 52, 4.0 - 30.0 Nm	401				●		
EC-i 52, 200 W	269						130.7		online
EC-i 52, 200 W	269	GP 52, 4.0 - 30.0 Nm	401				●		online
DCX 22 S	89-90								online
DCX 22 L	91-92								online
DCX 26 L	93-94								online
DCX 32 L	95								
DCX 35 L	96								

Technical Data

Supply voltage V_{CC}	5 V ± 10%
Typical current draw	55 mA
Output signal	EIA Standard RS 422
driver used:	DS26LS31
Phase shift Φ	90°e ± 45°e
Signal rise time (typically, at C_L = 25 pF, R_L = 2.7 kΩ, 25 °C)	180 ns
Signal fall time (typically, at C_L = 25 pF, R_L = 2.7 kΩ, 25 °C)	40 ns
Index pulse width	90°e
Operating temperature range	-40...+100 °C
Moment of inertia of code wheel	≤ 0.6 gcm²
Max. angular acceleration	250 000 rad s^{-2}
Output current per channel	± 20 mA

The index signal I is synchronized with channel A or B.

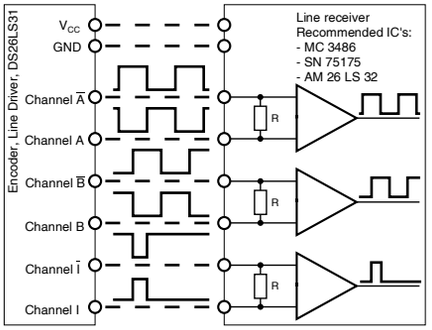
Pin Allocation



1 N.C.
2 V_{CC}
3 GND
4 N.C.
5 Channel $\overline{A}$
6 Channel A
7 Channel $\overline{B}$
8 Channel B
9 Channel $\overline{I}$ (Index)
10 Channel I (Index)

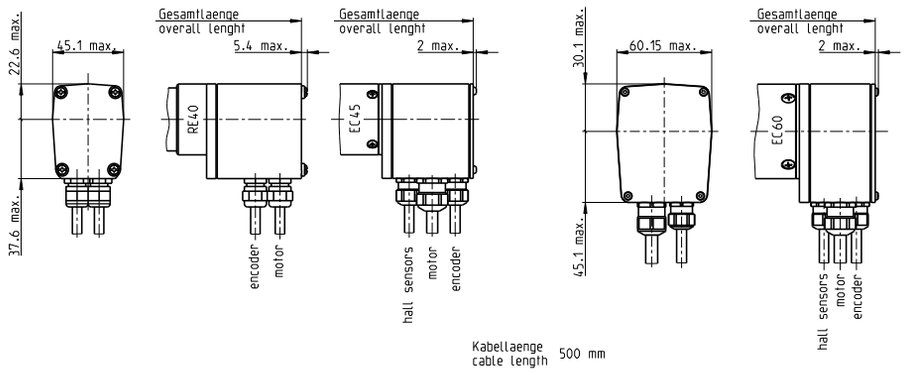
Pin type DIN 41651/
EN 60603-13
flat band cable AWG 28

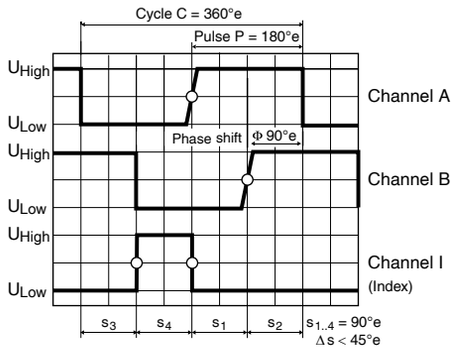
Connection example



Terminal resistance R = typical 120 Ω

Encoder HEDL 9140 500 CPT, 3 Channels, with Line Driver RS 422





Direction of rotation cw (definition cw p. 68)

Stock program
Standard program
Special program (on request)

Part Numbers	
	137959
Type	
Counts per turn	500
Number of channels	3
Max. operating frequency (kHz)	100
Max. speed (rpm)	12000

maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
RE 40, 150 W	141					125.1
RE 40, 150 W	141	GP 42, 3 - 15 Nm	396			●
RE 40, 150 W	141	GP 52, 4 - 30 Nm	401			●
RE 40, 150 W	141			AB 28	520	135.6
RE 40, 150 W	141	GP 42, 3 - 15 Nm	396	AB 28	520	●
RE 40, 150 W	141	GP 52, 4 - 30 Nm	401	AB 28	520	●
EC 45, 150 W	230					126.8
EC 45, 150 W	230	GP 42, 3 - 15 Nm	396			●
EC 45, 150 W	230	GP 52, 4 - 30 Nm	401			●
EC 45, 150 W	230			AB 28	520	135.6
EC 45, 150 W	230	GP 42, 3 - 15 Nm	396	AB 28	520	●
EC 45, 150 W	230	GP 52, 4 - 30 Nm	401	AB 28	520	●
EC 45, 250 W	231					159.6
EC 45, 250 W	231	GP 42, 3 - 15 Nm	397			●
EC 45, 250 W	231	GP 52, 4 - 30 Nm	401			●
EC 45, 250 W	231	GP 62, 8 - 50 Nm	403			●
EC 45, 250 W	231			AB 28	520	168.4
EC 45, 250 W	231	GP 42, 3 - 15 Nm	396	AB 28	520	●
EC 45, 250 W	231	GP 52, 4 - 30 Nm	401	AB 28	520	●
EC 45, 250 W	231	GP 62, 8 - 50 Nm	403	AB 28	520	●
EC 60, 400 W	232					177.3
EC 60, 400 W	232	GP 81, 20 - 120 Nm	404			●
EC 60, 400 W	232			AB 41	523	214.9
EC 60, 400 W	232	GP 81, 20 - 120 Nm	404	AB 41	523	●

Technical Data	
Supply voltage V_{CC}	5 V ± 10%
Typical current draw	55 mA
Output signal	EIA Standard RS 422
driver used:	DS26LS31
Phase shift Φ	90°e ± 45°e
Signal rise time	
(typically, at C_L = 25 pF, R_L = 11 kΩ, 25 °C)	180 ns
Signal fall time	
(typically, at C_L = 25 pF, R_L = 11 kΩ, 25 °C)	40 ns
Index pulse width	90°e
Operating temperature range	-40...+85 °C
Moment of inertia of code wheel	≤ 0.6 gcm²
Max. angular acceleration	250000 rad s^{-2}
Output current per channel	± 20 mA

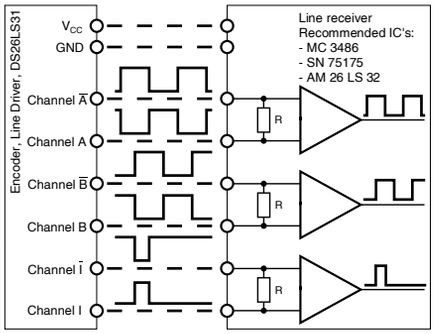
The index signal I is synchronized with channel A or B.

Pin Allocation

Cable white	=	2 V_{CC} 5 VDC
Cable brown	=	3 GND
Cable green	=	5 Channel $\overline{A}$
Cable yellow	=	6 Channel A
Cable grey	=	7 Channel $\overline{B}$
Cable pink	=	8 Channel B
Cable blue	=	9 Channel $\overline{I}$ (Index)
Cable red	=	10 Channel I (Index)

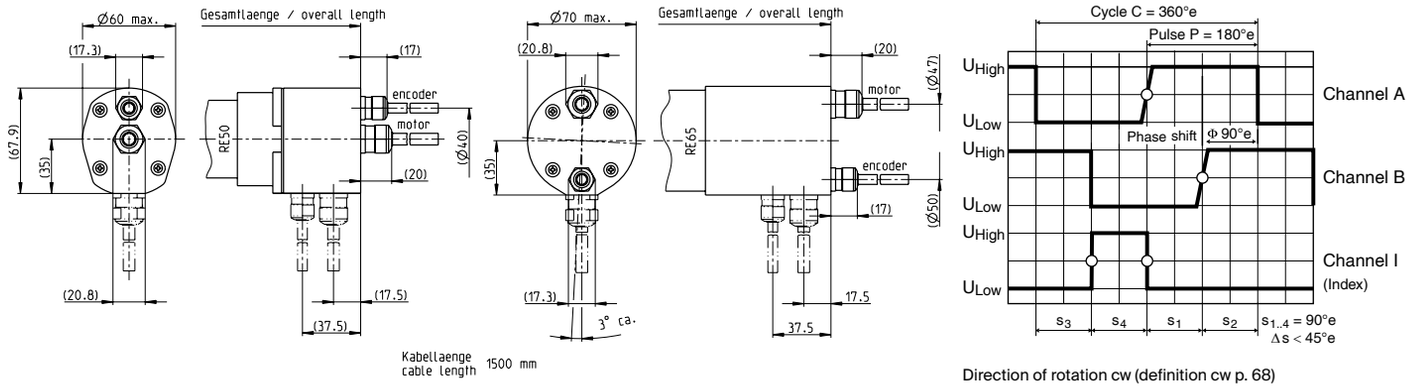
Cable size 8 × 0.25 mm²

Connection example



Terminal resistance R = typical 120 Ω

Encoder HEDL 9140 500 CPT, 3 Channels, with Line Driver RS 422



Direction of rotation cw (definition cw p. 68)

Stock program
Standard program
Special program (on request)

	Part Numbers	
cable outlet axial	386051	386001
cable outlet radial	386053	386002
Type		
Counts per turn	500	500
Number of channels	3	3
Max. operating frequency (kHz)	100	100
Max. speed (rpm)	12000	12000

maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead	
RE 50, 200 W	142					170.4	
RE 50, 200 W	142	GP 52, 4 - 30 Nm	401			●	
RE 50, 200 W	142	GP 62, 8 - 50 Nm	403			●	
RE 50, 200 W	142			AB 44	524	183.4	
RE 50, 200 W	142	GP 52, 4 - 30 Nm	401	AB 44	524	●	
RE 50, 200 W	142	GP 62, 8 - 50 Nm	403	AB 44	524	●	
RE 65, 250 W	143						187.5
RE 65, 250 W	143	GP 81, 20 - 120 Nm	404				●
RE 65, 250 W	143			AB 44	524		205.5
RE 65, 250 W	143	GP 81, 20 - 120 Nm	404	AB 44	524		●

Technical Data

Supply voltage V_{CC}	5 V ± 10%
Typical current draw	55 mA
Output signal	EIA Standard RS 422
driver used:	DS26LS31
Phase shift Φ	90°e ± 45°e
Signal rise time	
(typically, at C_L = 25 pF, R_L = 11 kΩ, 25 °C)	180 ns
Signal fall time	
(typically, at C_L = 25 pF, R_L = 11 kΩ, 25 °C)	40 ns
Index pulse width	90°e
Operating temperature range	-40...+85 °C
Moment of inertia of code wheel	≤ 0.6 gcm²
Max. angular acceleration	250000 rad s^{-2}
Output current per channel	± 20 mA
Protection to	IP54

The index signal I is synchronized with channel A or B.

Pin Allocation

Encoder

Cable white	=	V_{CC} 5 VDC
Cable brown	=	GND
Cable green	=	Channel $\overline{A}$
Cable yellow	=	Channel A
Cable grey	=	Channel $\overline{B}$
Cable pink	=	Channel B
Cable blue	=	Channel $\overline{I}$ (Index)
Cable red	=	Channel I (Index)

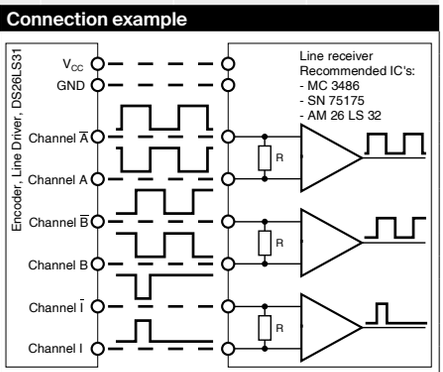
Cable size 8 × 0.25 mm²

Motor

Cable white	=	Motor +
Cable brown	=	Motor -

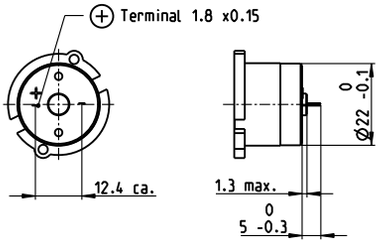
Cable size 2 × 1.0 mm²

Connection example



Terminal resistance R = typical 120 Ω

DC Tacho DCT 22 0.52 Volt

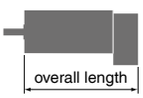


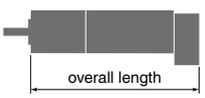
Important Information

- Tacho with moving coil, maxon system.
- Tacho with precious metal commutation.
- To establish total inertia add motor and tacho inertias.
- With the output shaft turning CW as seen from the mounting surface, the tacho output voltage will be positive at the + terminal.
- A high impedance load is recommended at tacho terminals.
- The tacho current should be kept low.
- The indicated resonance frequency refers to the motor-tacho rotor system.

Stock program
Standard program
Special program (on request)

Part Numbers		
	118909	118910
Type		
Shaft diameter (mm)	3	4





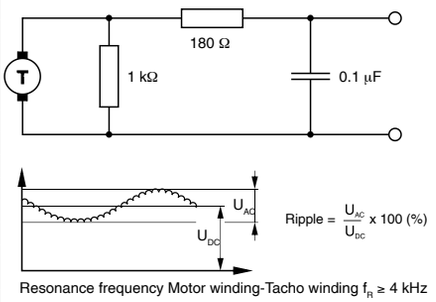
maxon Modular System

+ Motor	Page	+ Gearhead	Page	Overall length [mm] / ● see Gearhead	
RE 25	134/136			76.8	
RE 25	134/136	GP 26, 0.75 - 4.5 Nm	381	●	
RE 25	134/136	GP 32, 0.75 - 4.5 Nm	383/384	●	
RE 25	134/136	GP 32, 1.0 - 6.0 Nm	387	●	
RE 25	134/136	GP 32, 1.0 - 4.5 Nm	394	●	
RE 25	134/136	GP 32 S	416-421	●	
RE 25, 20 W	135			65.3	
RE 25, 20 W	135	GP 22, 0.5 - 1.0 Nm	374	●	
RE 25, 20 W	135	GP 26, 0.75 - 4.5 Nm	381	●	
RE 25, 20 W	135	GP 32, 0.75 - 4.5 Nm	383/384	●	
RE 25, 20 W	135	GP 32, 0.75 - 6.0 Nm	387	●	
RE 25, 20 W	135	KD 32, 1.0 - 4.5 Nm	394	●	
RE 25, 20 W	135	GP 32 S	416-421	●	
RE 35, 90 W	139				89.1
RE 35, 90 W	139	GP 32, 0.75 - 6.0 Nm	383-390		●
RE 35, 90 W	139	GP 32, 4.0 - 8.0 Nm	391		●
RE 35, 90 W	139	GP 42, 3.0 - 15 Nm	396		●
RE 35, 90 W	139	GP 32 S	416-421		●

Technical Data

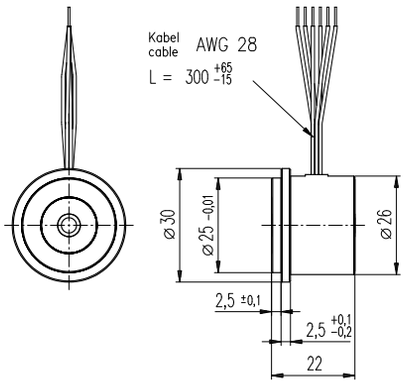
Output voltage per 1000 rpm	0.52 V	Max. current	10 mA
Terminal resistance tacho	37.7 Ω	Tolerance of the output voltage	± 15 %
Typical peak to peak ripple	≤ 6 %	Rotor inertia (tacho only)	< 3 gcm²
Ripple frequency per turn	14	Resonance frequency with motors on p. 134–136	> 2 kHz
Linear voltage tolerance, 500 to 5000 rpm	± 0.2 %	with motors on p. 139	> 4.5 kHz
Linear voltage tolerance with 10 kΩ load resistance	± 0.7 %	Temperature range	-20 ... +65 °C
Polarity error	± 0.1 %		
Temperature coefficient of EMF (magnet)	-0.02 % /°C	Option: Pigtails in place of solder terminals.	
Temperature coefficient of coil resistance	+0.4 % /°C		

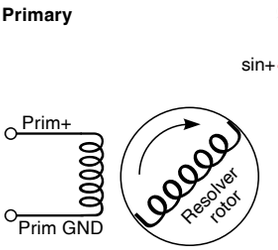
Connection example

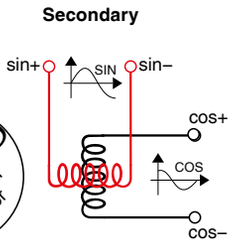


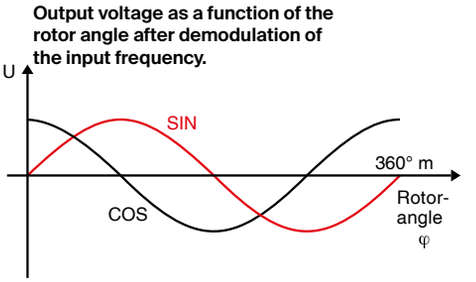
Resonance frequency Motor winding-Tacho winding $f_R \geq 4$ kHz

Resolver Res 26 10 Volt



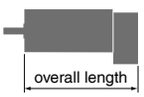


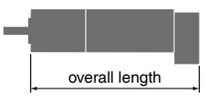




Stock program
Standard program
Special program (on request)

Part Numbers	166488	133405	268912	199287
Type				
Shaft diameter (mm)	4	6	6	6
Max. speed (rpm)	10 000	10 000	10 000	10 000





maxon Modular System

+ Motor	Page	+ Gearhead	Page	Overall length [mm] / ● see Gearhead						
EC 32, 80 W	228			80.1						
EC 32, 80 W	228	GP 32, 0.75 - 6.0 Nm	383-390	●						
EC 32, 80 W	228	GP 32 S	416-421	●						
EC 40, 170 W	229				107.2					
EC 40, 170 W	229	GP 42, 3.0 - 15 Nm	396		●					
EC 40, 170 W	229	GP 52, 4.0 - 30 Nm	401		●					
EC 45, 150 W	230					111.2				
EC 45, 150 W	230	GP 42, 3.0 - 15 Nm	396			●				
EC 45, 150 W	230	GP 52, 4.0 - 30 Nm	401			●				
EC 45, 250 W	231					144.0				
EC 45, 250 W	231	GP 42, 3.0 - 15 Nm	396			●				
EC 45, 250 W	231	GP 52, 4.0 - 30 Nm	401			●				
EC 45, 250 W	231	GP 62, 8.0 - 50 Nm	403			●				
EC 60, 400 W	232						177.3			
EC 60, 400 W	232	GP 81, 20 - 120 Nm	404				●			

Technical Data

Input voltage	10 V peak, 10 kHz
Transmission ratio	0.5
Electrical error	± 10 minutes
Rotor inertia	6 gcm²
Weight	40 g
Operating temperature range	-55 ... +155°C

Pin Allocation

	EC 32/EC 40	EC 45/EC 60
Prim +	red/white	white
Prim GND	yellow/white	brown
cos +	red	green
sin +	yellow	yellow
cos –	schwarz	grey
sin –	blue	pink

sensor

For your personal notes

maxon motor & motion control

Various 4-quadrant PWM servo controllers for permanent magnet-activated brushed DC motors and brushless EC motors meet all requirements in terms of performance and functionality. Thanks to the fast current controller and dynamic speed controller, outstanding control characteristics are achieved. Combined with maxon high-dynamic motors and master controllers, the positioning controllers constitute complete solutions for highly demanding motion control applications.

ESCON Overview

The ESCON servo controllers are small-sized, powerful 4-quadrant PWM servo controller for the highly efficient control of permanent magnet-activated DC motors.

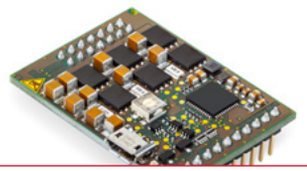
The featured operating modes – speed control (closed loop), speed control (open loop), and current control – meet the highest requirements. The ESCON servo controllers are designed being commanded by an analog set value and features extensive analog and digital I/O functionality and are being configured via USB interface using the graphical user interface "ESCON Studio".

ESCON Module 24/2
466023

ESCON 36/2 DC
403112

ESCON 36/3 EC
414533

ESCON Module 50/4 EC-S
446925



ESCON Module 50/5
438725

ESCON 50/5
409510

ESCON Module 50/8 (HE)
532872
586137

ESCON 70/10
422969

Depending on the ESCON variant, the following **motor types** can be operated
- **DC motor:** Permanent-magnet DC motor
- **EC motor:** Brushless, electronically commutated permanent-magnet DC motor (BLDC) with and without Hall sensors.

Various **operating modes** allow an adaptable use in a wide range of drive systems
- **Current controller:** The current controller compares the actual motor current (torque) with the applied set value. In case of deviation, the motor current is dynamically readjusted.
- **Speed controller (closed loop):** The closed loop speed controller compares the actual speed signal with the applied set value. In case of deviation, the speed is dynamically readjusted.
- **Speed controller (open loop):** The open loop speed controller feeds the motor with a voltage proportional to the applied speed set value. Changes in load are compensated using the IxR methodology.

Speed measurement by
- **Digital incremental encoder:** The encoders deliver simple square signals for further processing. Their impulses are counted to determine the speed. Channels A and B are phase-shifted signals, which are being compared to determine the direction of rotation.
- **DC tacho:** The DC tacho delivers a speed-proportional analog voltage.
- **Available Hall sensors:** The Hall sensors deliver six different combinations of switching impulses per electrical turn which are counted to determine speed. They also deliver phase-shifted signals that are being compared to determine the direction of rotation.
- **Sensorless EC:** The speed is determined by the progression of the induced voltage. The electronics evaluates the zero crossing of the induced voltage (EMF).

To the numerous **inputs** and **outputs,** various functionalities can be assigned to.

Set value (speed or current), **current limitation,** as well as **offset** can be assigned as follows.
- **Analog value:** The value is defined by an analog voltage set via external or internal potentiometer.
- **PWM value:** The value is defined by fixed frequency and amplitude. The desired change is achieved by variation of the duty cycle of 10...90%.
- **RC Servo Value:** The value is set with a signal pulse with a duration of 1.0...2.0 ms.
- **Fixed value:** The value is defined by a fixed preset value.
- **2 fixed values:** Value 1 is defined by a fixed preset value 1. Value 2 is defined by a fixed preset value 2. A digital input is used to switch between the two preset values.

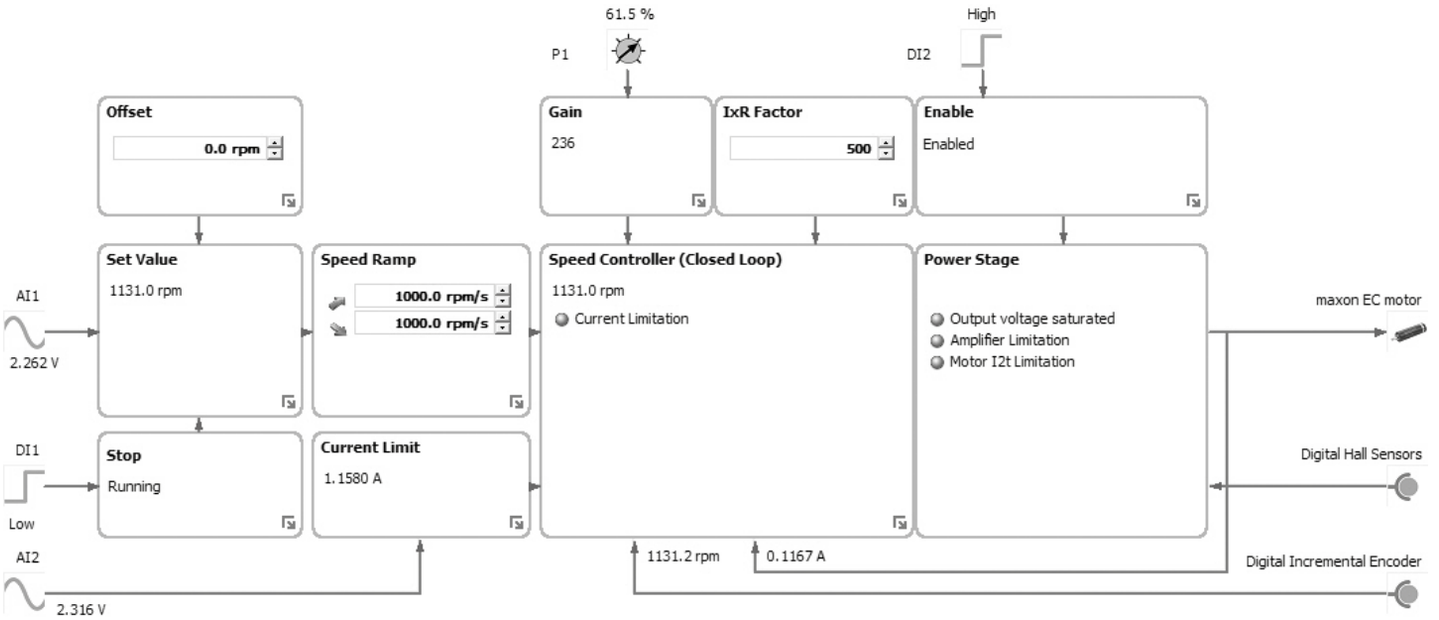
Various functionalities are available to **enable** the power stage.
- **Enable:** Enables or disables the power stage.
- **Enable & Direction:** Enables or disables the power stage and determines the motor shaft's direction of rotation.

Software
Installation Program: ESCON Setup
Graphical User Interface: ESCON Studio
✓ Startup Wizard
✓ Regulation Tuning
✓ Diagnostic
✓ Firmware Update
✓ Controller Monitor
✓ Parameters
✓ Data Recording
✓ Online Help
Language: German, English, French, Italian, Spanish, Japanese, Chinese
Operating System: Windows 10, Windows 8, Windows 7, Windows XP SP3
Communication interface: USB 2.0/3.0 (full speed)

Easy startup
Startup and parameterization are performed using the intuitive graphical user interface "ESCON Studio" with the help of simple to use, menu-guided wizards. The following wizards are available: Startup, Regulation Tuning, Firmware Update, Controller Monitor, Parameters, Data Recording, and Diagnostics.

Protective equipment
The servo controller has protective circuits against overcurrent, excess temperature, under- and overvoltage, against voltage transients, and against short-circuits in the motor cable. Furthermore it is equipped with protected digital inputs and outputs and an adjustable current limitation for protecting the motor and the load. The motor current and the actual speed of the motor shaft can be monitored by means of the analog output voltage.

Comprehensive documentation
Using the "Feature Comparison Chart", the suitable ESCON servo controller can easily be determined. The "Hardware Reference" comprises the specifications of the hardware in detail. The documents "Firmware Version" and "Release Notes" describe changes and improvements of firmware and software. In addition, the graphical user interface "ESCON Studio" features a comprehensive online help.



ESCON Studio (Controller Monitor)

– **Enable CW:** Enables or disables the power stage in direction of rotation-dependent sense. The rotor can only turn clockwise (CW).
– **Enable CCW:** Enables or disables the power stage in direction of rotation-dependent sense. The rotor can only turn counterclockwise (CCW).
– **Enable CW & CCW:** Enables or disables the power stage in direction of rotation-dependent sense. The rotor can only turn in defined direction. The signals are interlocked against each other.

The **ramp function** permits controlled acceleration/deceleration of the motor shaft in both, open loop and closed loop speed controller mode.
– **Analog ramp:** The ramp is defined by a variable analog value.
– **Fixed ramp:** The ramp is defined by a fixed preset value.

Stop: The motor shaft decelerates with preset speed ramp until complete standstill.

Ready: The Ready signal can be used to transmit the operational status (respectively fault) to a superior control.

Speed and Current Comparator: The digital output is set depending on the actual value.
– **Limit:** The digital output is set as soon as the preset value is reached. It remains set as long as the value is exceeded.
– **Range:** The digital output is set as soon as the preset value range is reached. It remains set as long as the value remains in range.
– **Deviation:** The digital output is set as soon as the preset value deviation (based on the set value) is in range.

With the integrated **potentiometers** the additional following functions can be adjusted
– **Current Gain:** Adjustment of the current controller gain.
– **Speed Gain:** Adjustment of the speed controller gain.
– **IxR Factor:** The voltage drop caused by terminal resistance will be compensated in the range of [0...1000...2000].

Analog outputs allow monitoring of
– **Actual current:** Actually measured motor winding current.
– **Actual current averaged:** Actually measured motor winding current filtered by first order digital low-pass filter with a cut-off frequency of 5 Hz.
– **Actual speed:** Actually measured motor speed.
– **Actual speed averaged:** Actually measured motor speed filtered by 1st order digital low-pass filter with a cut-off frequency of 5 Hz.
– **Demand Current:** Demanded motor winding current.
– **Demand Speed:** Demanded motor speed.
– **Temperature Power Stage:** Actually measured power stage temperature.
– **Fixed value:** The output voltage is said fixed to the preset value.

Accessories ESCON (not included in delivery)		466023 Module 24/2	403112 36/2 DC	414533 36/3 EC	446925 Module 50/4 EC-S	438725 Module 50/5	532872 Module 50/8	586137 Module 50/8 HE	409510 50/5	422969 70/10
404404	ESCON 36/2 DC Connector Set		✓							
425255	ESCON 36/3 EC Connector Set			✓						
403962	DC Motor Cable		✓							
403964	I/O Cable 7core (analog I/O's)		✓	✓						
403965	I/O Cable 6core (digital I/O's)		✓	✓						
275934	Encoder Cable		✓						✓	✓
403957	Power Cable		✓	✓						
403968	USB Type A - micro B Cable	✓	✓	✓	✓	✓	✓	✓	✓	✓
418719	Adapter BLACK FPC11poles			✓						
418723	Adapter BLUE FPC8poles			✓						
418721	Adapter GREEN FPC8poles			✓						
486400	ESCON Module 24/2 Motherboard	✓								
438779	ESCON Module Motherboard					✓				
586048	ESCON Module 50/8 Motherboard						✓	✓		
450237	ESCON Module Motherboard Sensorless				✓					
586142	ESCON Module 50/8 Thermal Pad						✓			

ESCON Feature Comparison Chart

	ESCON Module 24/2	ESCON 36/2 DC
DC motors up to (continuous / maximum)	48 W / 144 W	72 W / 144 W
EC motors up to (continuous / maximum)	48 W / 144 W	–
Sensors		
	Digital Incremental Encoder (2 channel with or without Line Driver)	Digital Incremental Encoder (2 channel with or without Line Driver)
	DC Tacho	DC Tacho
	Without sensor (DC motors)	Without sensor (DC motors)
	Digital Hall Sensors (EC motors)	–
Operating mode		
	Current controller (torque control), Speed controller (closed and open loop)	Current controller (torque control), Speed controller (closed and open loop)
Electrical data		
Nominal operating voltage V_{CC}	10 - 24 VDC	10 - 36 VDC
Max. output voltage	0.98 x V_{CC}	0.98 x V_{CC}
Max. output current	6 A (<4 s)	4 A (<60 s)
Continuous output current	2 A	2 A
Pulse width modulation frequency	53.6 kHz	53.6 kHz
Sampling rate PI current controller	53.6 kHz	53.6 kHz
Sampling rate PI speed controller	5.36 kHz	5.36 kHz
Max. efficiency	92%	95%
Max. speed (DC)	limited by max. speed (motor) and max. output voltage (controller)	limited by max. speed (motor) and max. output voltage (controller)
Max. speed (EC; 1 pole pair)	150 000 rpm	–
Built-in motor choke	–	300 µH / 2 A
Inputs/Outputs		
Hall sensor signals	H1, H2, H3	–
Encoder signals	A, A\, B, B\	A, A\, B, B\
Max. encoder input frequency differential (single-ended)	1 MHz (100 kHz)	1 MHz (100 kHz)
Potentiometers	–	1
Digital inputs	2	2
Digital inputs/outputs	2	2
Analog inputs Resolution, Range, Circuit	2 12-bit, -10...+10 V, differential	2 12-bit, -10...+10 V, differential
Analog outputs Resolution, Range, Max. output current	2 12-bit, -4...+4 V, 1 mA	2 12-bit, -4...+4 V, 1 mA
Auxiliary voltage output	+5 VDC (IL ≤10 mA)	+5 VDC (IL ≤10 mA)
Hall sensor supply voltage	+5 VDC (IL ≤30 mA)	–
Encoder supply voltage	+5 VDC (IL ≤70 mA)	+5 VDC (IL ≤70 mA)
Status Indicators	Operation: green LED / Error: red LED	Operation: green LED / Error: red LED
Environmental conditions		
Temperature – Operation	-30...+60°C	-30...+45°C
Temperature – Extended range	+60...+80°C; Derating: -0.100 A/°C	+45...+81°C; Derating: -0.056 A/°C
Temperature – Storage	-40...+85°C	-40...+85°C
Humidity (condensation not permitted)	5...90%	5...90%
Mechanical data		
Weight	Approx. 7 g	Approx. 30 g
Dimensions (L x W x H)	35.6 x 26.7 x 12.7 mm	55.0 x 40.0 x 16.1 mm
Mounting holes	Plugable (socket headers with 2.54 mm pitch)	for screws M2.5
Part numbers		
	466023 ESCON Module 24/2	**403112** ESCON 36/2 DC
	Order accessories separately, from page 513	Order accessories separately, from page 513

ESCON Feature Comparison Chart

ESCON 36/3 EC	ESCON Module 50/4 EC-S	ESCON Module 50/5
	–	250 W / 750 W
97 W / 324 W	200 W / 600 W	250 W / 750 W
Sensors		
–	–	Digital Incremental Encoder (2 channel with or without Line Driver)
–	–	DC Tacho
–	Without sensor (EC motors)	Without sensor (DC motors)
Digital Hall Sensors (EC motors)	–	Digital Hall Sensors (EC motors)
Operating mode		
Current controller (torque control), Speed controller (closed and open loop)	Speed controller (closed and open loop)	Current controller (torque control), Speed controller (closed and open loop)
Electrical data		
10 - 36 VDC	10 - 50 VDC	10 - 50 VDC
0.98 x V_{CC}	0.96 x V_{CC}	0.98 x V_{CC}
9 A (<4 s)	12 A (<30 s)	15 A (<20 s)
2.7 A	4 A	5 A
53.6 kHz	53.6 kHz	53.6 kHz
53.6 kHz	–	53.6 kHz
5.36 kHz	5.36 kHz	5.36 kHz
95%	97%	98%
–	–	limited by max. speed (motor) and max. output voltage (controller)
150 000 rpm	120 000 rpm	150 000 rpm
3 x 47 µH / 2.7 A	–	–
Inputs/Outputs		
H1, H2, H3	–	H1, H2, H3
–	–	A, A\, B, B\
–	–	1 MHz (100 kHz)
1	1	1
2	2	2
2	2	2
2 12-bit, -10...+10 V, differential	2 12-bit, -10...+10 V, differential	2 12-bit, -10...+10 V, differential
2 12-bit, -4...+4 V, 1 mA	2 12-bit, -4...+4 V, 1 mA	2 12-bit, -4...+4 V, 1 mA
+5 VDC (IL ≤10 mA)	+5 VDC (IL ≤110 mA)	+5 VDC (IL ≤10 mA)
+5 VDC (IL ≤30 mA)	–	+5 VDC (IL ≤30 mA)
–	–	+5 VDC (IL ≤70 mA)
Operation: green LED / Error: red LED	Operation: green LED / Error: red LED	Operation: green LED / Error: red LED
Environmental conditions		
-30...+45°C	-30...+45°C	-30...+45°C
+45...+78°C; Derating: -0.082 A/°C	+45...+65°C; Derating -0.200 A/°C	+45...+75°C; Derating: -0.167 A/°C
-40...+85°C	-40...+85°C	-40...+85°C
5...90%	5...90%	5...90%
Mechanical data		
Approx. 36 g	Approx. 11 g	Approx. 12 g
55.0 x 40.0 x 19.8 mm	43.2 x 31.8 x 12.7 mm	43.2 x 31.8 x 12.7 mm
for screws M2.5	Plugable (socket headers with 2.54 mm pitch)	Plugable (socket headers with 2.54 mm pitch)
Part numbers		
414533 ESCON 36/3 EC	**446925** ESCON Module 50/4 EC-S	**438725** ESCON Module 50/5
Order accessories separately, from page 513	Order accessories separately, from page 513	Order accessories separately, from page 513

ESCON Feature Comparison Chart

	ESCON Module 50/8	ESCON Module 50/8 HE
DC motors up to (continuous / maximum)	400 W / 750 W	400 W / 750 W
EC motors up to (continuous / maximum)	400 W / 750 W	400 W / 750 W
Sensors		
	Digital Incremental Encoder (2 channel with or without Line Driver)	Digital Incremental Encoder (2 channel with or without Line Driver)
	DC Tacho	DC Tacho
	Without sensor (DC motors)	Without sensor (DC motors)
	Digital Hall Sensors (EC motors)	Digital Hall Sensors (EC motors)
Operating mode		
	Current controller (torque control), Speed controller (closed and open loop)	Current controller (torque control), Speed controller (closed and open loop)
Electrical data		
Nominal operating voltage V_{CC}	10 - 50 VDC	10 - 50 VDC
Max. output voltage	0.98 x V_{CC}	0.98 x V_{CC}
Max. output current	15 A (<20 s)	15 A (<20 s)
Continuous output current	8 A	8 A
Pulse width modulation frequency	53.6 kHz	53.6 kHz
Sampling rate PI current controller	53.6 kHz	53.6 kHz
Sampling rate PI speed controller	5.36 kHz	5.36 kHz
Max. efficiency	99%	99%
Max. speed (DC)	limited by max. speed (motor) and max. output voltage (controller)	limited by max. speed (motor) and max. output voltage (controller)
Max. speed (EC; 1 pole pair)	150 000 rpm	150 000 rpm
Built-in motor choke	–	–
Inputs/Outputs		
Hall sensor signals	H1, H2, H3	H1, H2, H3
Encoder signals	A, A\, B, B\	A, A\, B, B\
Max. encoder input frequency differential (single-ended)	1 MHz (100 kHz)	1 MHz (100 kHz)
Potentiometers	–	–
Digital inputs	2	2
Digital inputs/outputs	2	2
Analog inputs Resolution, Range, Circuit	2 12-bit, -10...+10 V, differential	2 12-bit, -10...+10 V, differential
Analog outputs Resolution, Range, Max. output current	2 12-bit, -4...+4 V, 1 mA	2 12-bit, -4...+4 V, 1 mA
Auxiliary voltage output	+5 VDC (IL ≤10 mA)	+5 VDC (IL ≤10 mA)
Hall sensor supply voltage	+5 VDC (IL ≤30 mA)	+5 VDC (IL ≤30 mA)
Encoder supply voltage	+5 VDC (IL ≤70 mA)	+5 VDC (IL ≤70 mA)
Status Indicators	Operation: green LED / Error: red LED	Operation: green LED / Error: red LED
Environmental conditions		
Temperature – Operation	-40...+45°C	-40...+65°C
Temperature – Extended range	+45...+85°C; Derating: see device reference	+65...+92°C; Derating: see device reference
Temperature – Storage	-40...+85°C	-40...+85°C
Humidity (condensation not permitted)	5...90%	5...90%
Mechanical data		
Weight	Approx. 16 g	Approx. 84 g
Dimensions (L x W x H)	53.3 x 37.5 x 14.5 mm	53.3 x 37.5 x 30.6 mm
Mounting holes	Plugable (socket headers with 2.54 mm pitch)	Plugable (socket headers with 2.54 mm pitch)
Part numbers		
	532872 ESCON Module 50/8	**586137** ESCON Module 50/8 HE
	Order accessories separately, from page 513	Order accessories separately, from page 513

ESCON Feature Comparison Chart

	ESCON 50/5	ESCON 70/10
DC motors up to (continuous / maximum)	250 W / 750 W	700 W / 2100 W
EC motors up to (continuous / maximum)	250 W / 750 W	700 W / 2100 W
Sensors		
	Digital Incremental Encoder (2 channel with or without Line Driver)	Digital Incremental Encoder (2 channel with or without Line Driver)
	DC Tacho	DC Tacho
	Without sensor (DC motors)	Without sensor (DC motors)
	Digital Hall Sensors (EC motors)	Digital Hall Sensors (EC motors)
Operating mode		
	Current controller (torque control), Speed controller (closed and open loop)	Current controller (torque control), Speed controller (closed and open loop)
Electrical data		
Nominal operating voltage V_{CC}	10 - 50 VDC	10 - 70 VDC
Max. output voltage	0.98 x V_{CC}	0.95 x V_{CC}
Max. output current	15 A (<20 s)	30 A (<20 s)
Continuous output current	5 A	10 A
Pulse width modulation frequency	53.6 kHz	53.6 kHz
Sampling rate PI current controller	53.6 kHz	53.6 kHz
Sampling rate PI speed controller	5.36 kHz	5.36 kHz
Max. efficiency	95%	98%
Max. speed (DC)	limited by max. speed (motor) and max. output voltage (controller)	limited by max. speed (motor) and max. output voltage (controller)
Max. speed (EC; 1 pole pair)	150 000 rpm	150 000 rpm
Built-in motor choke	3 x 30 µH / 5 A	3 x 15 µH / 10 A
Inputs/Outputs		
Hall sensor signals	H1, H2, H3	H1, H2, H3
Encoder signals	A, A\, B, B\	A, A\, B, B\
Max. encoder input frequency differential (single-ended)	1 MHz (100 kHz)	1 MHz (100 kHz)
Potentiometers	2	2
Digital inputs	2	2
Digital inputs/outputs	2	2
Analog inputs	2	2
Resolution, Range, Circuit	12-bit, -10...+10 V, differential	12-bit, -10...+10 V, differential
Analog outputs	2	2
Resolution, Range, Max. output current	12-bit, -4...+4 V, 1 mA	12-bit, -4...+4 V, 1 mA
Auxiliary voltage output	+5 VDC (IL ≤10 mA)	+5 VDC (IL ≤10 mA)
Hall sensor supply voltage	+5 VDC (IL ≤30 mA)	+5 VDC (IL ≤30 mA)
Encoder supply voltage	+5 VDC (IL ≤70 mA)	+5 VDC (IL ≤70 mA)
Status Indicators	Operation: green LED / Error: red LED	Operation: green LED / Error: red LED
Environmental conditions		
Temperature – Operation	-30...+45°C	-30...+45°C
Temperature – Extended range	+45...+85°C; Derating: -0.111 A/°C	+45...+82°C; Derating: -0.270 A/°C
Temperature – Storage	-40...+85°C	-40...+85°C
Humidity (condensation not permitted)	5...90%	5...90%
Mechanical data		
Weight	Approx. 204 g	Approx. 259 g
Dimensions (L x W x H)	115 x 75.5 x 24 mm	125 x 78.5 x 27 mm
Mounting holes	for screws M4	for screws M4
Part numbers		
	409510 ESCON 50/5	**422969** ESCON 70/10
	Order accessories separately, from page 513	Order accessories separately, from page 513

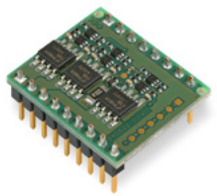
1-Q-EC Amplifier Summary

The basic function of EC motors electronics is the electronic commutation of the motor winding.

Simple speed controls are possible with Hall sensors. A further distinction is made between open or closed loop speed control.

1-Q amplifier functions in motor operation. Direction reverse via digital signal.

DEC Module 24/2 1-Q-EC Amplifier



The DEC Module 24/2 (Digital EC Controller) is a 1-quadrant amplifier for controlling EC motors with Hall sensors with a maximum output of 48 watts.
Technical data page 491.

Operating modes
Digital speed control or open loop speed control operation can be preset by a digital signal.

Excellent price-performance ratio
Reasonably priced 1-Q-EC amplifier optimized for OEM applications in small appliances.

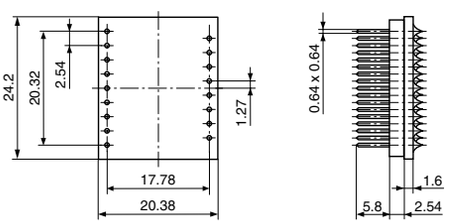
OEM Module
Miniaturized open electronics board. Two connector arrays arranged in a 2.54 mm (0.1“) pattern support easy connectivity and integration into the motherboard.

Functionality
Direction of rotation preset by a digital signal. The motor shaft can be enabled or disabled. Adjustable maximum current limitation. Set value speed input through external analog voltage. Status indicator with “Ready”-Output.

Protection circuit
The power amplifier is protected against thermal overload and the control inputs against overvoltage.

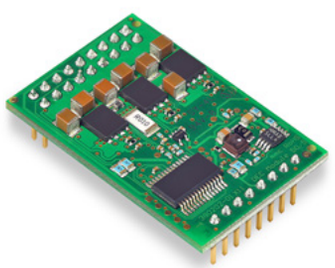
DEC Module 24/2

Connections	
Male header	8 + 9 = 17 poles
Pitch	2.54 mm
DEC Module 24/2	**367661**



Dimensions in [mm]

DEC Module 50/5 1-Q-EC Amplifier



The DEC Module 50/5 (Digital EC Controller) is a 1-quadrant amplifier for controlling EC motors with Hall sensors with a maximum output of 250 watts.
Technical data page 491.

Operating modes
Digital speed control or open loop speed control operation can be preset by a digital signal.

Excellent price-performance ratio
Reasonably priced 1-Q-EC amplifier optimised for OEM applications in small appliances.

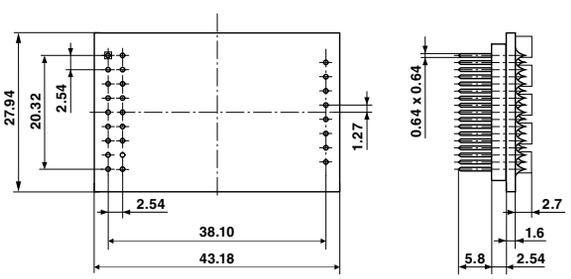
OEM Module
Miniaturized open electronics board. Connector arrays arranged in a 2.54 mm (0.1“) pattern support easy connectivity and integration into the motherboard.

Functionality
Direction of rotation preset by a digital signal. The motor shaft can be enabled or disabled. Adjustable maximum current limitation. Set value speed input through external analog voltage. Speed can be monitored through the speed monitor output. Status indicator with “Ready”-Output.

Protection circuit
The power amplifier is protected against thermal overload and the control inputs against overvoltage.

DEC Module 50/5

Connections	
Male header 1	2 rows, 2 x 9 poles
Male header 2	1 row, 8 poles
Pitch	2.54 mm
DEC Module 50/5	**380200**



Dimensions in [mm]

1-Q-EC Amplifier Data

DEC Module 24/2 1-Q-EC Amplifier
1-quadrant amplifier for controlling EC motors with Hall sensors with a maximum output of 48 watts.

DEC Module 50/5 1-Q-EC Amplifier
1-quadrant amplifier for controlling EC motors with Hall sensors with a maximum output of 250 watts.

	DEC Module 24/2	DEC Module 50/5
EC motors up to (continuous / maximum)	48 W / 72 W	250 W / 500 W
Sensors		
	Digital Hall Sensors	Digital Hall Sensors
Operating mode		
	Speed controller (closed and open loop)	Speed controller (closed and open loop)
Electrical data		
Operating voltage V_{CC}	8 - 24 VDC (optional 5.0 VDC)	6 - 50 VDC (optional 5.0 VDC)
Max. output voltage	V_{CC}	0.95 x V_{CC}
Max. output current I_{max}	3 A	10 A
Continuous output current I_{cont}	2 A	5 A
Switching frequency of power stage	46.8 kHz	46.8 kHz
Max. speed (1 pole pair)	80 000 rpm	80 000 rpm
Input		
Set value	“Speed” 0...+5 V (1024 steps)	“Speed” 0...+5 V (1024 steps)
Current limit	“Current Limit” external resistor against GND	“Current Limit” external resistor against GND
Enable	“Enable” +2.4...24 V	“Enable” +2.4...50 V
Direction	“Direction” +2.4...24 V	“Direction” +2.4...50 V
Output		
Monitor		“Monitor n”, digital (5 V)
Status reading “Ready”	“Ready”, digital (5 V)	“Ready”, digital (5 V)
Voltage outputs		
Hall sensors supply voltage V_{CC} Hall	+5 VDC, max. 35 mA	+5 VDC, max. 35 mA
Possible adjustments	Input “Mode 0” and “Mode 1”	Input “Mode 0” and “Mode 1”
Protective functions		
Blockage protection	Motor current limitation if motor shaft is blocked for longer than 1.5 s	Motor current limitation if motor shaft is blocked for longer than 1.5 s
Thermal protection of power stage	T > 95°C	T > 100°C
Under- / Overvoltage protection	Switches off when V_{CC} < 6.5 V or V_{CC} > 30 V	Switches off when V_{CC} < 6 V or V_{CC} > 56 V
Ambient temperature and humidity range		
Operation	-10...+45°C	-10...+45°C
Storage	-40...+85°C	-40...+85°C
No condensation	20...80%	20...80%
Mechanical data		
Weight	Approx. 4 g	Approx. 9 g
Dimensions (L x W x H)	24.2 x 20.38 x 12.7 mm (see page 490)	43.18 x 27.94 x 12.7 mm (see page 490)
Mounting	mountable on socket terminal strips pitch 2.54 mm	mountable on socket terminal strips pitch 2.54 mm
Connections	See page 490	See page 490
Part numbers		
	367661 DEC Module 24/2 1-Q-EC Amplifier	**380200** DEC Module 50/5 1-Q-EC Amplifier
Accessories		
	370652 DEC Module Eva-Board	**370652** DEC Module Eva-Board

EPOS4 Positioning Controllers Overview

Modules

Micro

NEW EPOS4 Micro 24/5 CAN

NEW EPOS4 Micro 24/5 EtherCAT

Module

EPOS4 Module 24/1.5

EPOS4 Module 50/5

EPOS4 Module 50/8

EPOS4 Module 50/15

Ready-to-connect units

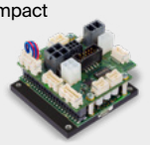
Compact CAN

EPOS4 Compact 24/1.5 CAN

EPOS4 Compact 50/5 CAN

EPOS4 Compact 50/8 CAN

EPOS4 Compact 50/15 CAN



Compact EtherCAT

EPOS4 Compact 24/1.5 EtherCAT

EPOS4 Compact 50/5 EtherCAT

EPOS4 Compact 50/8 EtherCAT

EPOS4 Compact 50/15 EtherCAT

NEW EPOS4 Compact 24/5 EtherCAT 3-axes

Encased housing

EPOS4 50/5

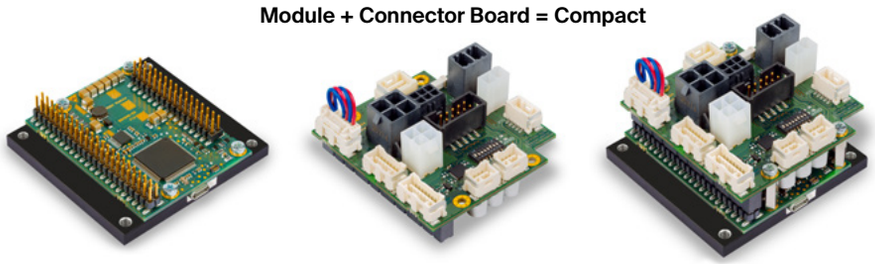
EPOS4 70/15

EPOS4

EPOS4 is the next generation of our CANopen positioning controller. It combines maximum power density with improved control performance and better functionality. The modular concept also provides for a wide variety of expansion options with Ethernet-based interfaces like EtherCAT or absolute rotary encoders. All these innovations combined with the proven concepts of the EPOS product line are consistently based on the successful principle of the **E**asy to use **PO**sitioning **S**ystem.

As part of the new modular system, the EPOS4 controllers can be with ready-to-install connector boards into compact solutions that match a wide variety of requirements. Optional expansion modules make it possible to provide custom basic functionalities at low cost:

Module + Connector Board = Compact



EPOS4 is a modular digital positioning controller. It is suitable for permanent magnet-activated DC motors and brushless, electronically commutated EC motors with incremental or absolute encoders with an operational range of up to 1050 W continuous power. The variety of operating modes provides high flexibility: The controllers are suitable for use in a wide range of drive systems in automation and mechatronics.

Cyclic Synchronuous Position (CSP)
The master executes the path planning and sends the target position cyclically and synchronously to the EPOS4 via the network. The position control loop runs on the EPOS4. The EPOS4 sends the measured actual position, speed and current values to the master.

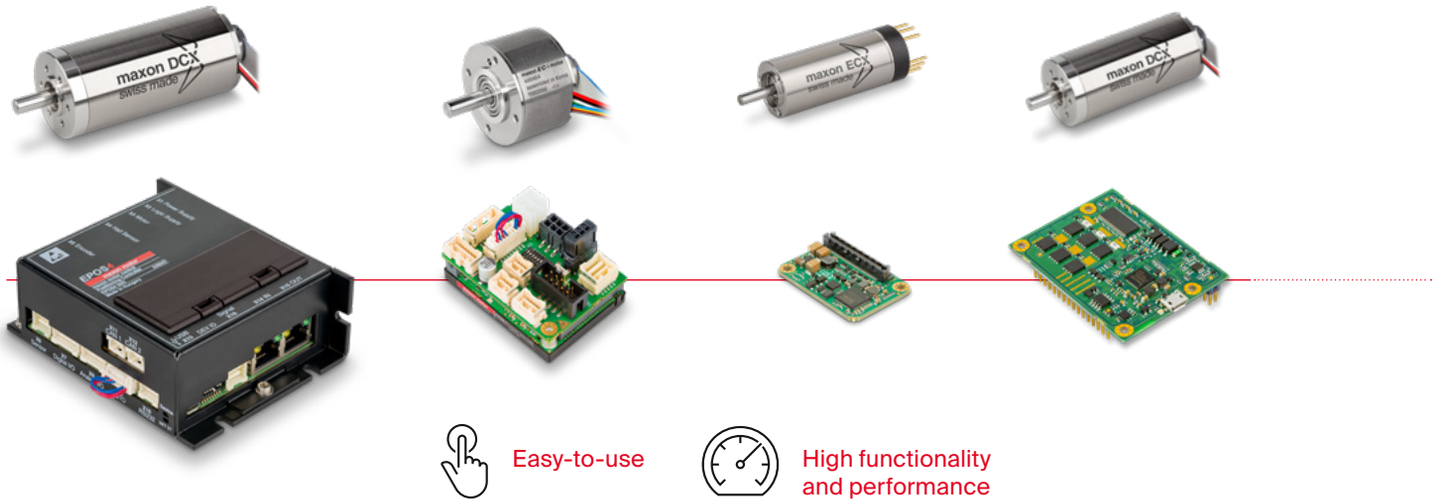
Cyclic Synchronuous Velocity (CSV)
The master executes the path planning and sends the target speed cyclically and synchronously to the EPOS4 via the network. The speed control loop runs on the EPOS4. The EPOS4 sends the measured actual position, speed and current values to the master. The CSV mode is commonly used if a PI position control loop is closed via the master.

Cyclic Synchronuous Torque (CST)
The master executes the path planning and sends the target torque cyclically and synchronously to the EPOS4 via the network. The torque (current) control loop runs on the EPOS4. The EPOS4 sends the measured actual position, speed and current values to the master. The CST mode is commonly used if a PID position control loop is closed via the master.

Point-to-point
The “Profile Position Mode” moves the position of the motor axis from point A to point B. Posi-

EtherCAT CANopen

USB RS232 GUI



Easy-to-use

High functionality and performance

tioning is in relation to the axis Home position (absolute) or the actual axis position (relative).

Position and velocity control with feed forward
The combination of feedback and feed forward control provides ideal motion behavior. Feed forward control reduces control error. EPOS4 supports feed forward acceleration and speed control.

Speed control
In the Profile Velocity Mode, the motor axis is moved with a defined set speed. The motor axis keeps the speed constant until a new speed set value is given.

Homing
The Homing Mode is used for referencing to a specific mechanical position. There is a wide variety of methods available.

Feedback options and dual loop
Two different encoder signals can be evaluated simultaneously. This allows dual-loop control, which can be tuned automatically to compensate for mechanical backlash and elasticity. A wide range of sensors is permitted: digital incremental encoders, analog incremental encoders (sin/cos), and SSI absolute encoders.

Protection
The positioning controller has protective circuits against overcurrent, excess temperature, under- and overvoltage, voltage transients, short-circuits in the motor cable, and against feedback signal loss. An adjustable current limitation protects the motor and load.

Safe Torque Off (STO)
With this safety feature based on IEC61800-5-2 (not certified), the drive can be brought to a safe state at any time from two independent digital inputs. The supply of torque-generating power is interrupted.
The state can be monitored via an additional digital output. The inputs and outputs are optically isolated.

Capture Inputs (Touch Probe)
The digital inputs can be configured so that the actual position value is stored whenever a positive or negative edge occurs at an input.

Trigger Output (Position Compare)
The digital outputs can be configured to that a digital signal is sent at a selectable position value (on request).

Control of Holding Brakes
Control of holding brakes can be integrated in the device status management. The delay times can be individually configured for switching on and off.

Supplementary information for technical data page 495–501.

Operating modes/Control
Cyclic Synchronous Position (CSP)
Cyclic Synchronous Velocity (CSV)
Cyclic Synchronous Torque (CST)
Profile Position, Profile Velocity and Homing Mode
Speed and Acceleration Feed Forward
Sinusoidal or Block Commutation for EC motors
Alternative set value input via analog commands
Dual-loop Position and Speed Control
Communication/Configuration
Communication via CANopen and/or USB 2.0/3.0 and/or RS232
EtherCAT (CoE)
USB to CAN and RS232 to CAN gateway
Inputs/Outputs
STO (Safe Torque Off) inputs and outputs, optically isolated, not certified
Free digital inputs, configurable e.g. for limit/reference switches
Free digital outputs, configurable e.g. for brake
Free analog inputs, configurable
Free analog ouputs, configurable
Available software
EPOS Studio
Windows DLL (32-/64-bit) with programming examples
Linux shared object library (X86 32-/64-bit, ARMv6/v7/v8 32-bit, ARMv8 64-bit for Raspberry Pi and BeagleBone) with programming examples
Firmware
Available documentation
Feature Chart
Hardware Reference
Firmware Specification
Communication Guide
Application Notes

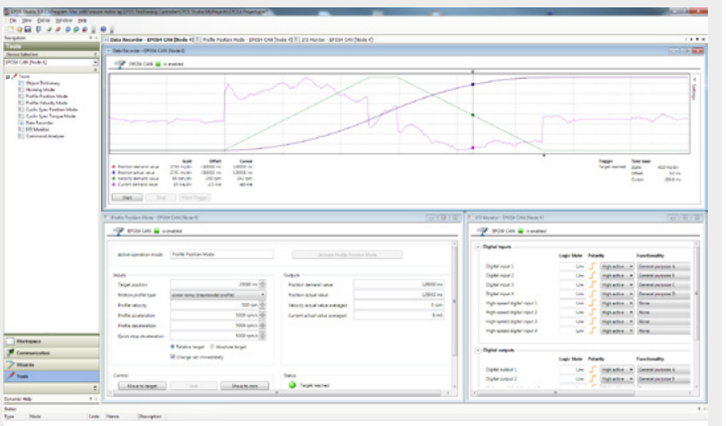
EPOS4 Positioning Controllers Overview

EtherCAT CANopen

USB RS232 GUI

EPOS4 performance characteristics
- Maximum power density.
- Convincing control performance even with highly dynamic motors.
- Comprehensive feedback options.
- Diverse I/O connection options for peripherals.
- Uncompromising protective features for controller and drive.
- Configuration and communication via CANopen (CiA 301, 402, 305), RS232, USB, or EtherCAT. IEC 61158 type 12 EtherCAT slave: CoE (CAN application layer over EtherCAT) compliant with IEC 61800-7 profile type 1 (CiA 402). Easy integration into existing EtherCAT systems. Can be connected to a network of other EtherCAT units.
- Easy commissioning via EPOS studio GUI and intuitive tools.
- Libraries and programming examples for efficient integration in a wide variety of systems.
- All software components are freely available at any time.
- Full documentation and outstanding support.

The complete package for your motion control solution with added value.



Accessories EPOS4 (not included in delivery)	638328 Micro 24/5 CAN	654731 Micro 24/5 EtherCAT	536630 Module 24/1.5	534130 Module 50/5	504384 Module 50/8	504383 Module 50/15
403968 USB Type A - micro B Cable			✓	✓	✓	✓
536997 EPOS4 CB 24/1.5 CAN			✓			
620048 EPOS4 CB 24/1.5 EtherCAT			✓			
534133 EPOS4 CB 50/5 CAN				✓		
620044 EPOS4 CB 50/5 EtherCAT				✓		
520884 EPOS4 CB Power CAN					✓	✓
604594 EPOS4 CB Power EtherCAT					✓	✓
581245 EPOS4 EtherCAT Card			✓ (c)	✓ (c)	✓ (c)	✓ (c)
638677 EPOS4 EB Micro	✓	✓				
659508 EPOS4 MB Micro EtherCAT 3-axes		✓				
590738 EPOS4 Module SMT socket 2 x 23 poles			✓	✓		
677324 EPOS4 Micro SMT socket 2 x 40 poles	✓	✓				

	684519 Compact 24/1.5 EtherCAT 3-axes	546714 Compact 24/1.5 CAN	628092 Compact 24/1.5 EtherCAT	541718 Compact 50/5 CAN	628094 Compact 50/5 EtherCAT	520885 Compact 50/8 CAN	605298 Compact 50/8 EtherCAT	520886 Compact 50/15 CAN	605299 Compact 50/15 EtherCAT	546047 50/5	594385 70/15
520858 CAN-CAN Cable		✓		✓		✓		✓		✓	✓
520857 CAN-COM Cable		✓		✓		✓		✓		✓	✓
275934 Encoder Cable		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
275878 Hall Sensor Cable	✓			✓	✓	✓	✓	✓	✓	✓	✓
520854 Signal Cable 7core	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
520853 Signal Cable 8core	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
275851 Motor Cable	✓			✓	✓	✓	✓	✓	✓		✓
520851 Motor Cable High Current							✓	✓			✓
275829 Power Cable	✓ (a)					✓ (a)	✓ (a)	✓ (a)	✓		✓ (a)
520850 Power Cable High Current	✓ (b)					✓ (b)	✓ (b)	✓ (b)			✓ (b)
520856 RS232-COM Cable		✓		✓		✓	✓		✓	✓	
520852 Sensor Cable 5 x 2core	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
520860 STO Idle Connector X9		✓ (i)	✓ (i)	✓ (i)	✓ (i)	✓ (i)	✓ (i)	✓ (i)	✓ (i)	✓ (i)	
403968 USB Type A - micro B Cable	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
422827 Ethernet Cable	✓		✓		✓		✓	✓	✓	✓	
581245 EPOS4 EtherCAT Card									✓	✓	
520859 EPOS4 Connector Set		✓	✓	✓	✓	✓	✓	✓	✓	✓	
309687 DSR 50/5	✓	✓	✓	✓	✓				✓		
235811 DSR 70/30	✓					✓	✓	✓		✓	

(a) optional for separate logic supply (b) mandatory for supply of power stage (c) with matching motherboard (i) included

Additional accessories from page 513

EPOS4 Positioning Controllers Data

EtherCAT CANopen

USB RS232 GUI

NEW

EPOS4 Micro 24/5 CAN
Miniaturized OEM positioning controller module, designed for use with brushed DC motors with encoders and brushless EC motors (BLDC) with Hall sensors and encoders up to 120 W/360 W.

NEW

EPOS4 Micro 24/5 EtherCAT
Miniaturized OEM positioning controller module, designed for use with brushed DC motors with encoders and brushless EC motors (BLDC) with Hall sensors and encoders up to 120 W/360 W.

Controller version		
	CANopen Slave	**EtherCAT Slave**
Electrical data		
Operating voltage V_{CC}	10 - 24 VDC	10 - 24 VDC
Logic supply voltage V_C (optional)	10 - 24 VDC	10 - 24 VDC
Max. output voltage	0.9 x V_{CC}	0.9 x V_{CC}
Max. output current I_{max}	15 A (<10 s)	15 A (<10 s)
Continuous output current I_{cont}	5 A	5 A
Switching frequency of power stage	50 kHz	50 kHz
Sampling rate of PI current controller	25 kHz (40 µs)	25 kHz (40 µs)
Sampling rate of PI speed controller	2.5 kHz (400 µs)	2.5 kHz (400 µs)
Sampling rate of PID position controller	2.5 kHz (400 µs)	2.5 kHz (400 µs)
Max. speed (1 pole pair)	50 000 rpm (sinusoidal), 100 000 rpm (block)	50 000 rpm (sinusoidal), 100 000 rpm (block)
Built-in motor choke per phase	–	–
Inputs		
Hall sensor signals	H1, H2, H3	H1, H2, H3
Encoder signals	A, A\, B, B\, I, I\ (max. 6.25 MHz)	A, A\, B, B\, I, I\ (max. 6.25 MHz)
Sensor signals	Clock, Data	Clock, Data
Digital inputs	4 (logic level)	4 (logic level)
Digital inputs “High-speed”	1	1
Analog inputs	2 (12-bit resolution, -10...+10 V)	2 (12-bit resolution, -10...+10 V)
CAN ID / DEV ID	configurable with external wiring	–
Outputs		
Digital outputs	2	2
Digital outputs “High-speed”	1	1
Analog outputs	1 (12-bit resolution, -4...+4 V, max. 1 mA)	1 (12-bit resolution, -4...+4 V, max. 1 mA)
Encoder voltage output	+5 VDC, max. 120 mA	+5 VDC, max. 120 mA
Hall sensor voltage output	+5 VDC, max. 30 mA	+5 VDC, max. 30 mA
Auxiliary voltage output	–	–
Interfaces		
RS232	RxD; TxD (max. 115 200 bit/s)	–
CAN	high; low (max. 1 Mbit/s)	–
USB 2.0/3.0	Data+; Data- (Full Speed)	Data+; Data- (Full Speed)
EtherCAT	–	100 Mbit/s (Full Duplex)
Indicator		
LED green = READY, red= ERROR	Green LED, red LED	Green LED, red LED
Environmental conditions		
Temperatrue – Operation	-30...+45 °C	-30...+40 °C
Temperature – Extended Range	+45...+70 °C; Derating: -0.200 A/°C	+40...+60 °C; Derating: -0.25 A/°C
Temperature – Storage	-40...+85 °C	-40...+85 °C
Humidity (condensation not permitted)	5...90%	5...90%
Mechanical data		
Weight	approx. 6 g	approx. 7 g
Dimensions (L x W x H)	32.0 x 22.0 x 7.0 mm	36.5 x27.0 x7.0 mm
Mounting	M2 screws	M2 screws
Part numbers		
	638328 EPOS4 Micro 24/5 CAN	**654731** EPOS4 Micro 24/5 EtherCAT
Accessories		
	309687 DSR 50/5 Shunt regulator	**309687** DSR 50/5 Shunt regulator
	Order accessories separately, see page 512	Order accessories separately, see page 512

EPOS4 Positioning Controllers Data

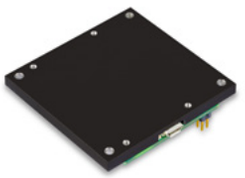
EtherCAT CANopen

USB RS232 GUI

	EPOS4 Module 24/1.5 OEM position control module, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 36/108 Watt.	**EPOS4 Module 50/5** OEM position control module, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 250/750 Watt.
Controller version		
	CANopen Slave with EtherCAT option	**CANopen Slave with EtherCAT option**
Electrical data		
Operating voltage V_{CC}	10 - 24 VDC	10 - 50 VDC
Logic supply voltage V_C (optional)	10 - 24 VDC	10 - 50 VDC
Max. output voltage	0.9 x V_{CC}	0.9 x V_{CC}
Max. output current I_{max}	4.5 A (<30 s)	15 A (<3 s)
Continuous output current I_{cont}	1.5 A	5 A
Switching frequency of power stage	100 kHz	50 kHz
Sampling rate of PI current controller	25 kHz (40 µs)	25 kHz (40 µs)
Sampling rate of PI speed controller	2.5 kHz (400 µs)	2.5 kHz (400 µs)
Sampling rate of PID position controller	2.5 kHz (400 µs)	2.5 kHz (400 µs)
Max. speed (1 pole pair)	50 000 rpm (sinusoidal), 100 000 rpm (block)	50 000 rpm (sinusoidal), 100 000 rpm (block)
Built-in motor choke per phase	–	–
Inputs		
Hall sensor signals	H1, H2, H3	H1, H2, H3
Encoder signals	A, A\, B, B\, I, I\ (max. 6.25 MHz)	A, A\, B, B\, I, I\ (max. 6.25 MHz)
Sensor signals	A, A\, B, B\, I, I\, Clock, Clock\, Data, Data\	A, A\, B, B\, I, I\, Clock, Clock\, Data, Data\
Digital inputs	4 (logic level)	4 (logic level)
Digital inputs “High-speed”	4, differential	4, differential
Analog inputs	2 (12-bit resolution, -10...+10 V)	2 (12-bit resolution, -10...+10 V)
CAN ID / DEV ID	configurable with external wiring	configurable with external wiring
Outputs		
Digital outputs	2	2
Digital outputs “High-speed”	1, differential	1, differential
Analog outputs	2 (12-bit resolution, -4...+4 V, max. 1 mA)	2 (12-bit resolution, -4...+4 V, max. 1 mA)
Encoder voltage output	+5 VDC, max. 70 mA	+5 VDC, max. 70 mA
Hall sensor voltage output	+5 VDC, max. 30 mA	+5 VDC, max. 30 mA
Auxiliary voltage output	+5 VDC, max. 150 mA	+5 VDC, max. 150 mA
Interfaces		
RS232	RxD; TxD (max. 115 200 bit/s)	RxD; TxD (max. 115 200 bit/s)
CAN	high; low (max. 1 Mbit/s)	high; low (max. 1 Mbit/s)
USB 2.0/3.0	Data+; Data- (Full Speed)	Data+; Data- (Full Speed)
EtherCAT	Optional 581245 EPOS4 EtherCAT Card available	Optional 581245 EPOS4 EtherCAT Card available
Indicator		
LED green = READY, red= ERROR	Green LED, red LED	Green LED, red LED
Environmental conditions		
Temperatrue – Operation	-30...+60 °C	-30...+45 °C
Temperature – Extended Range	+60...+73 °C; Derating: -0.115 A/°C	+45...+75 °C; Derating: -0.167 A/°C
Temperature – Storage	-40...+85 °C	-40...+85 °C
Humidity (condensation not permitted)	5...90%	5...90%
Mechanical data		
Weight	approx. 17 g	approx. 17 g
Dimensions (L x W x H)	53.8 x 38.8 x 11.1 mm	53.8 x 38.8 x 11.1 mm
Mounting	Socket header 1.27 mm or M2.5 screws	Socket header 1.27 mm or M2.5 screws
Part numbers		
	536630 EPOS4 Module 24/1.5	**534130** EPOS4 Module 50/5
Accessories		
	309687 DSR 50/5 Shunt regulator	**309687** DSR 50/5 Shunt regulator
	Order accessories separately, see page 512	Order accessories separately, see page 512

EPOS4 Positioning Controllers Data

EPOS4 Module 50/8
OEM position control module, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 400/1500 Watt.



EPOS4 Module 50/15
OEM position control module, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 750/1500 Watt.

NEW

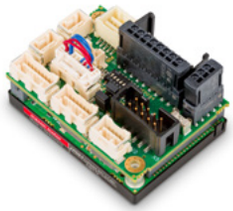
EPOS4 Compact 24/5 EtherCAT 3-axes
Ready-to-install 3-axis compact solution, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 120/360 W per axis.

Controller version		
CANopen Slave with EtherCAT option	**CANopen Slave with EtherCAT option**	**EtherCAT Slave**
Electrical data		
10 - 50 VDC	10 - 50 VDC	10 - 24 VDC
10 - 50 VDC	10 - 50 VDC	10 - 24 VDC
0.9 x V_{CC}	0.9 x V_{CC}	0.9 x V_{CC}
30 A (<5 s)	30 A (<60 s)	15 A (<10 s) per axis
8 A	15 A	5 A per axis
50 kHz	50 kHz	50 kHz
25 kHz (40 µs)	25 kHz (40 µs)	25 kHz (40 µs)
2.5 kHz (400 µs)	2.5 kHz (400 µs)	2.5 kHz (400 µs)
2.5 kHz (400 µs)	2.5 kHz (400 µs)	2.5 kHz (400 µs)
50 000 rpm (sinusoidal), 100 000 rpm (block)	50 000 rpm (sinusoidal), 100 000 rpm (block)	50 000 rpm (sinusoidal), 100 000 rpm (block)
–	–	–
Inputs		
H1, H2, H3	H1, H2, H3	H1, H2, H3 per axis
A, A\, B, B\, I, I\ (max. 6.25 MHz)	A, A\, B, B\, I, I\ (max. 6.25 MHz)	
A, A\, B, B\, I, I\, Clock, Clock\, Data, Data\	A, A\, B, B\, I, I\, Clock, Clock\, Data, Data\	A, A\, B, B\, I, I\, Clock, Clock\, Data, Data\ per axis
4 (logic level)	4 (logic level)	4 (level switchable: logic/PLC) per axis
4, differential	4, differential	–
2 (12-bit resolution, -10...+10 V)	2 (12-bit resolution, -10...+10 V)	2 (12-bit resolution, -10...+10 V) per axis
configurable with external wiring	configurable with external wiring	–
Outputs		
2	2	2 per axis
1, differential	1, differential	–
2 (12-bit resolution, -4...+4 V, max. 1 mA)	2 (12-bit resolution, -4...+4 V, max. 1 mA)	1 (12-bit resolution, -4...+4 V, max. 1 mA) per axis
+5 VDC, max. 70 mA	+5 VDC, max. 70 mA	+5 VDC, max. 100 mA per axis
+5 VDC, max. 30 mA	+5 VDC, max. 30 mA	+5 VDC, max. 30 mA per axis
+5 VDC, max. 150 mA	+5 VDC, max. 150 mA	
Interfaces		
RxD; TxD (max. 115 200 bit/s)	RxD; TxD (max. 115 200 bit/s)	–
high; low (max. 1 Mbit/s)	high; low (max. 1 Mbit/s)	–
Data+; Data- (Full Speed)	Data+; Data- (Full Speed)	Data+; Data- (Full Speed) per axis
Optional 581245 EPOS4 EtherCAT Card available	Optional 581245 EPOS4 EtherCAT Card available	100 Mbit/s (Full Duplex)
Indicator		
Green LED, red LED	Green LED, red LED	Green LED, red LED
Environmental conditions		
-30...+45 °C	-30...+25 °C	-30...+25 °C
+45...+77 °C; Derating: -0.250 A/°C	+25...+77 °C; Derating: -0.288 A/°C	+25...+50 °C; Derating: -0.200 A/°C
-40...+85 °C	-40...+85 °C	-40...+85 °C
5...90%	5...90%	5...90%
Mechanical data		
approx. 23 g	approx. 70 g	approx. 85 g
59.5 x 46.0 x 14.1 mm	59.5 x 62.0 x 16.4 mm	90.0 x 56.0 x 29.0 mm
Socket header 2.54 mm or M2.5 screws	Socket header 2.54 mm or M3 screws	M2.5 screws
Part numbers		
504384 EPOS4 Module 50/8	**504383** EPOS4 Module 50/15	**684519** EPOS4 Compact 24/5 EtherCAT 3-axes
Accessories		
235811 DSR 70/30 Shunt regulator	**235811** DSR 70/30 Shunt regulator	**235811** DSR 70/30 Shunt regulator
Order accessories separately, see page 512	Order accessories separately, see page 512	Order accessories separately, see page 512

EPOS4 Positioning Controllers Data

EtherCAT CANopen

USB RS232 GUI



	EPOS4 Compact 24/1.5 CAN Ready-to-install compact solution, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 36/108 Watt.	**EPOS4 Compact 24/1.5 EtherCAT** Ready-to-install compact solution, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 36/108 Watt.
Controller version		
	CANopen Slave	**EtherCAT Slave**
Electrical data		
Operating voltage V_{CC}	10 - 24 VDC	10 - 24 VDC
Logic supply voltage V_C (optional)	10 - 24 VDC	10 - 24 VDC
Max. output voltage	0.9 x V_{CC}	0.9 x V_{CC}
Max. output current I_{max}	4.5 A (<30 s)	4.5 A (<30 s)
Continuous output current I_{cont}	1.5 A	1.5 A
Switching frequency of power stage	100 kHz	100 kHz
Sampling rate of PI current controller	25 kHz (40 µs)	25 kHz (40 µs)
Sampling rate of PI speed controller	2.5 kHz (400 µs)	2.5 kHz (400 µs)
Sampling rate of PID position controller	2.5 kHz (400 µs)	2.5 kHz (400 µs)
Max. speed (1 pole pair)	50 000 rpm (sinusoidal), 100 000 rpm (block)	50 000 rpm (sinusoidal), 100 000 rpm (block)
Built-in motor choke per phase	94 µH / 1.5 A	100 µH / 1.5 A
Inputs		
Hall sensor signals	H1, H2, H3	H1, H2, H3
Encoder signals	A, A\, B, B\, I, I\ (max. 6.25 MHz)	A, A\, B, B\, I, I\ (max. 6.25 MHz)
Sensor signals	A, A\, B, B\, I, I\, Clock, Clock\, Data, Data\	A, A\, B, B\, I, I\, Clock, Clock\, Data, Data\
Digital inputs	4 (level switchable: logic/PLC)	4 (level switchable: logic/PLC)
Digital inputs “High-speed”	4, differential	4, differential
Analog inputs	2 (12-bit resolution, -10...+10 V)	2 (12-bit resolution, -10...+10 V)
CAN ID / DEV ID	configurable with DIP switch 1...5	configurable with DIP switch 1...5
Outputs		
Digital outputs	2	2
Digital outputs “High-speed”	1, differential	1, differential
Analog outputs	2 (12-bit resolution, -4...+4 V, max. 1 mA)	2 (12-bit resolution, -4...+4 V, max. 1 mA)
Encoder voltage output	+5 VDC, max. 70 mA	+5 VDC, max. 70 mA
Hall sensor voltage output	+5 VDC, max. 30 mA	+5 VDC, max. 30 mA
Auxiliary voltage output	+5 VDC, max. 150 mA	+5 VDC, max. 150 mA
Interfaces		
RS232	RxD; TxD (max. 115 200 bit/s)	–
CAN	high; low (max. 1 Mbit/s)	–
USB 2.0/3.0	Data+; Data- (Full Speed)	Data+; Data- (Full Speed)
EtherCAT	–	100 Mbit/s (Full Duplex)
Indicator		
LED green = READY, red= ERROR	Green LED, red LED	Green LED, red LED
Environmental conditions		
Temperatrue – Operation	-30...+45 °C	-30...+45 °C
Temperature – Extended Range	+45...+70 °C; Derating: -0.060 A/°C	+45...+70 °C; Derating: -0.060 A/°C
Temperature – Storage	-40...+85 °C	-40...+85 °C
Humidity (condensation not permitted)	5...90%	5...90%
Mechanical data		
Weight	approx. 58 g	approx. 78 g
Dimensions (L x W x H)	55.0 x 40.0 x 31.1 mm	55.0 x 56.5 x 31.7 mm
Mounting	M2.5 screws	M2.5 screws
Part numbers		
	546714 EPOS4 Compact 24/1.5 CAN	**628092** EPOS4 Compact 24/1.5 EtherCAT
Accessories		
	309687 DSR 50/5 Shunt regulator Order accessories separately, see page 512	**309687** DSR 50/5 Shunt regulator Order accessories separately, see page 512

EPOS4 Positioning Controllers Data

EPOS4 Compact 50/5 CAN
Ready-to-install compact solution, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 250/750 Watt.

EPOS4 Compact 50/5 EtherCAT
Ready-to-install compact solution, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 250/750 Watt.

EPOS4 Compact 50/8 CAN
Ready-to-install compact solution, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 400/1500 Watt.

Controller version		
CANopen Slave	**EtherCAT Slave**	**CANopen Slave**
Electrical data		
10 - 50 VDC	10 - 50 VDC	10 - 50 VDC
10 - 50 VDC	10 - 50 VDC	10 - 50 VDC
0.9 x V_{CC}	0.9 x V_{CC}	0.9 x V_{CC}
15 A (<3 s)	15 A (<3 s)	30 A (<5 s)
5 A	5 A	8 A
50 kHz	50 kHz	50 kHz
25 kHz (40 µs)	25 kHz (40 µs)	25 kHz (40 µs)
2.5 kHz (400 µs)	2.5 kHz (400 µs)	2.5 kHz (400 µs)
2.5 kHz (400 µs)	2.5 kHz (400 µs)	2.5 kHz (400 µs)
50 000 rpm (sinusoidal), 100 000 rpm (block)	50 000 rpm (sinusoidal), 100 000 rpm (block)	50 000 rpm (sinusoidal), 100 000 rpm (block)
9.4 µH / 5 A	10 µH / 5 A	2.2 µH / 15 A
Inputs		
H1, H2, H3	H1, H2, H3	H1, H2, H3
A, A\, B, B\, I, I\ (max. 6.25 MHz)	A, A\, B, B\, I, I\ (max. 6.25 MHz)	A, A\, B, B\, I, I\ (max. 6.25 MHz)
A, A\, B, B\, I, I\, Clock, Clock\, Data, Data\	A, A\, B, B\, I, I\, Clock, Clock\, Data, Data\	A, A\, B, B\, I, I\, Clock, Clock\, Data, Data\
4 (level switchable: logic/PLC)	4 (level switchable: logic/PLC)	4 (level switchable: logic/PLC)
4, differential	4, differential	4, differential
2 (12-bit resolution, -10...+10 V)	2 (12-bit resolution, -10...+10 V)	2 (12-bit resolution, -10...+10 V)
configurable with DIP switch 1...5	configurable with DIP switch 1...5	configurable with DIP switch 1...5
Outputs		
2	2	2
1, differential	1, differential	1, differential
2 (12-bit resolution, -4...+4 V, max. 1 mA)	2 (12-bit resolution, -4...+4 V, max. 1 mA)	2 (12-bit resolution, -4...+4 V, max. 1 mA)
+5 VDC, max. 70 mA	+5 VDC, max. 70 mA	+5 VDC, max. 70 mA
+5 VDC, max. 30 mA	+5 VDC, max. 30 mA	+5 VDC, max. 30 mA
+5 VDC, max. 150 mA	+5 VDC, max. 150 mA	+5 VDC, max. 150 mA
Interfaces		
RxD; TxD (max. 115 200 bit/s)	–	RxD; TxD (max. 115 200 bit/s)
high; low (max. 1 Mbit/s)	–	high; low (max. 1 Mbit/s)
Data+; Data- (Full Speed)	Data+; Data- (Full Speed)	Data+; Data- (Full Speed)
–	100 Mbit/s (Full Duplex)	–
Indicator		
Green LED, red LED	Green LED, red LED	Green LED, red LED
Environmental conditions		
-30...+25 °C	-30...+25 °C	-30...+45 °C
+25...+70 °C; Derating: -0.111 A/°C	+25...+70 °C; Derating: -0.111 A/°C	+45...+77 °C; Derating: -0.250 A/°C
-40...+85 °C	-40...+85 °C	-40...+85 °C
5...90%	5...90%	5...90%
Mechanical data		
approx. 58 g	approx. 76 g	approx. 86 g
55.0 x 40.0 x 31.1 mm	55.0 x 56.5 x 31.7 mm	59.5 x 58.5 x 33.0 mm
M2.5 screws	M2.5 screws	M2.5 screws
Part numbers		
541718 EPOS4 Compact 50/5 CAN	**628094** EPOS4 Compact 50/5 EtherCAT	**520885** EPOS4 Compact 50/8 CAN
Accessories		
309687 DSR 50/5 Shunt regulator	**309687** DSR 50/5 Shunt regulator	**235811** DSR 70/30 Shunt regulator
Order accessories separately, see page 512	Order accessories separately, see page 512	Order accessories separately, see page 512

EPOS4 Positioning Controllers Data

EtherCAT CANopen

USB RS232 GUI

EPOS4 Compact 50/8 EtherCAT
Ready-to-install compact solution, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 400/1500 Watt.

EPOS4 Compact 50/15 CAN
Ready-to-install compact solution, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 750/1500 Watt.

Controller version		
	EtherCAT Slave	**CANopen Slave**
Electrical data		
Operating voltage V_{CC}	10 - 50 VDC	10 - 50 VDC
Logic supply voltage V_C (optional)	10 - 50 VDC	10 - 50 VDC
Max. output voltage	0.9 x V_{CC}	0.9 x V_{CC}
Max. output current I_{max}	30 A (<5 s)	30 A (<60 s)
Continuous output current I_{cont}	8 A	15 A
Switching frequency of power stage	50 kHz	50 kHz
Sampling rate of PI current controller	25 kHz (40 µs)	25 kHz (40 µs)
Sampling rate of PI speed controller	2.5 kHz (400 µs)	2.5 kHz (400 µs)
Sampling rate of PID position controller	2.5 kHz (400 µs)	2.5 kHz (400 µs)
Max. speed (1 pole pair)	50 000 rpm (sinusoidal), 100 000 rpm (block)	50 000 rpm (sinusoidal), 100 000 rpm (block)
Built-in motor choke per phase	2.2 µH / 15 A	2.2 µH / 15 A
Inputs		
Hall sensor signals	H1, H2, H3	H1, H2, H3
Encoder signals	A, A\, B, B\, I, I\ (max. 6.25 MHz)	A, A\, B, B\, I, I\ (max. 6.25 MHz)
Sensor signals	A, A\, B, B\, I, I\, Clock, Clock\, Data, Data\	A, A\, B, B\, I, I\, Clock, Clock\, Data, Data\
Digital inputs	4 (level switchable: logic/PLC)	4 (level switchable: logic/PLC)
Digital inputs “High-speed”	4, differential	4, differential
Analog inputs	2 (12-bit resolution, -10...+10 V)	2 (12-bit resolution, -10...+10 V)
CAN ID / DEV ID	configurable with DIP switch 1...5	configurable with DIP switch 1...5
Outputs		
Digital outputs	2	2
Digital outputs “High-speed”	1, differential	1, differential
Analog outputs	2 (12-bit resolution, -4...+4 V, max. 1 mA)	2 (12-bit resolution, -4...+4 V, max. 1 mA)
Encoder voltage output	+5 VDC, max. 70 mA	+5 VDC, max. 70 mA
Hall sensor voltage output	+5 VDC, max. 30 mA	+5 VDC, max. 30 mA
Auxiliary voltage output	+5 VDC, max. 150 mA	+5 VDC, max. 150 mA
Interfaces		
RS232	–	RxD; TxD (max. 115 200 bit/s)
CAN	–	high; low (max. 1 Mbit/s)
USB 2.0/3.0	Data+; Data- (Full Speed)	Data+; Data- (Full Speed)
EtherCAT	100 Mbit/s (Full Duplex)	–
Indicator		
LED green = READY, red= ERROR	Green LED, red LED	Green LED, red LED
Environmental conditions		
Temperatrue – Operation	-30...+45 °C	-30...+25 °C
Temperature – Extended Range	+45...+77 °C; Derating: -0.250 A/°C	+25...+77 °C; Derating: -0.288 A/°C
Temperature – Storage	-40...+85 °C	-40...+85 °C
Humidity (condensation not permitted)	5...90%	5...90%
Mechanical data		
Weight	approx. 100 g	approx. 126 g
Dimensions (L x W x H)	59.5 x 79.5 x 35.7 mm	59.5 x 65.5 x 35.1 mm
Mounting	M2.5 screws	M3 screws
Part numbers		
	605298 EPOS4 Compact 50/8 EtherCAT	**520886** EPOS4 Compact 50/15 CAN
Accessories		
	235811 DSR 70/30 Shunt regulator	**235811** DSR 70/30 Shunt regulator
	Order accessories separately, see page 512	Order accessories separately, see page 512

EPOS4 Positioning Controllers Data

EPOS4 Compact 50/15 EtherCAT
Ready-to-install compact solution, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 750/1500 Watt.

EPOS4 50/5
Positioning controller in a robust housing, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 250/750 Watt.

EPOS4 70/15
Positioning controller in a robust housing, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 1050/2100 Watt.

Controller version		
EtherCAT Slave	**CANopen Slave with EtherCAT option**	**CANopen Slave with EtherCAT option**
Electrical data		
10 - 50 VDC	10 - 50 VDC	10 - 70 VDC
10 - 50 VDC	10 - 50 VDC	10 - 70 VDC
0.9 x V_{CC}	0.9 x V_{CC}	0.9 x V_{CC}
30 A (<60 s)	15 A (<15 s)	30 A (<60 s)
15 A	5 A	15 A
50 kHz	50 kHz	50 kHz
25 kHz (40 µs)	25 kHz (40 µs)	25 kHz (40 µs)
2.5 kHz (400 µs)	2.5 kHz (400 µs)	2.5 kHz (400 µs)
2.5 kHz (400 µs)	2.5 kHz (400 µs)	2.5 kHz (400 µs)
50 000 rpm (sinusoidal), 100 000 rpm (block)	50 000 rpm (sinusoidal), 100 000 rpm (block)	50 000 rpm (sinusoidal), 100 000 rpm (block)
2.2 µH / 15 A	15 µH / 5 A	15 µH / 15 A
Inputs		
H1, H2, H3	H1, H2, H3	H1, H2, H3
A, A\, B, B\, I, I\ (max. 6.25 MHz)	A, A\, B, B\, I, I\ (max. 6.25 MHz)	A, A\, B, B\, I, I\ (max. 6.25 MHz)
A, A\, B, B\, I, I\, Clock, Clock\, Data, Data\	A, A\, B, B\, I, I\, Clock, Clock\, Data, Data\	A, A\, B, B\, I, I\, Clock, Clock\, Data, Data\
4 (level switchable: logic/PLC)	4 (level switchable: logic/PLC)	4 (level switchable: logic/PLC)
4, differential	4, differential	4, differential
2 (12-bit resolution, -10...+10 V)	2 (12-bit resolution, -10...+10 V)	2 (12-bit resolution, -10...+10 V)
configurable with DIP switch 1...5	configurable with DIP switch 1...5	configurable with DIP switch 1...5
Outputs		
2	2	2
1, differential	1, differential	1, differential
2 (12-bit resolution, -4...+4 V, max. 1 mA)	2 (12-bit resolution, -4...+4 V, max. 1 mA)	2 (12-bit resolution, -4...+4 V, max. 1 mA)
+5 VDC, max. 70 mA	+5 VDC, max. 70 mA	+5 VDC, max. 70 mA
+5 VDC, max. 30 mA	+5 VDC, max. 30 mA	+5 VDC, max. 30 mA
+5 VDC, max. 150 mA	+5 VDC, max. 150 mA	+5 VDC, max. 150 mA
Interfaces		
–	RxD; TxD (max. 115 200 bit/s)	RxD; TxD (max. 115 200 bit/s)
–	high; low (max. 1 Mbit/s)	high; low (max. 1 Mbit/s)
Data+; Data- (Full Speed)	Data+; Data- (Full Speed)	Data+; Data- (Full Speed)
100 Mbit/s (Full Duplex)	Optional 581245 EPOS4 EtherCAT Card available	Optional 581245 EPOS4 EtherCAT Card available
Indicator		
Green LED, red LED	Green LED, red LED	Green LED, red LED
Environmental conditions		
-30...+25 °C	-30...+50 °C	-30...+50 °C
+25...+77 °C; Derating: -0.288 A/°C	+50...+80 °C; Derating: -0.167 A/°C	+50...+85 °C; Derating: -0.429 A/°C
-40...+85 °C	-40...+85 °C	-40...+85 °C
5...90%	5...90%	5...90%
Mechanical data		
approx. 140 g	approx. 206 g	approx. 372 g
59.5 x 79.5 x 37.8 mm	105.0 x 83.0 x 38.7 mm	125.0 x 94.5 x 38.7 mm
M3 screws	Flange for M4-screws	Flange for M4-screws
Part numbers		
605299 EPOS4 Compact 50/15 EtherCAT	**546047** EPOS4 50/5	**594385** EPOS4 70/15
Accessories		
235811 DSR 70/30 Shunt regulator	**309687** DSR 50/5 Shunt regulator	**235811** DSR 70/30 Shunt regulator
Order accessories separately, see page 512	Order accessories separately, see page 512	Order accessories separately, see page 512

EPOS2 P Programmable Positioning Controller Summary

Standalone operation

EPOS2 P 24/5 (programmable)
- IEC 61131-3 programmable
- CANopen Master function
- Multiple axis systems via CAN Bus CANopen
- Point to point control unit (1 axis)
- Interpolated Position Mode (PVT)
- DC and EC motors up to 120 W
- 6 digital inputs (TTL and PLC level)
- 4 digital outputs
- 2 analog inputs (12-bit ADC)
- Compact design

Details page 504

Standalone operation, programmable from PC via RS232 or USB 2.0/3.0 with standard IEC 61131-3. Program languages (ST, IL, FBD, LD, SFC). CANopen master function for controlling other axes. Standard motion control library. Supervisory Control and Data Acquistion for monitoring and controlling a process via RS232; USB 2.0/3.0 or CANopen.

Typical applications:
- Work equipment manufacturing
- Tool building
- System automation tasks

Part Number
EPOS2 P 24/5 **378308**

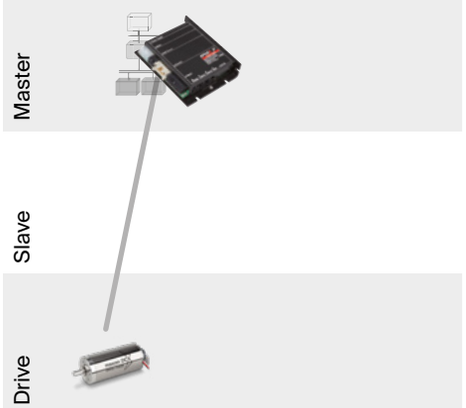
EPOS2 P is a freely programmable positioning controller with an integrated power stage, based on the EPOS2 slave version. It is suitable for DC and EC motors with incremental encoder and a continuous output power up to 120 W.

Standalone drive systems
With self-compiled programs, the standalone version of EPOS2 can autonomously control single and multiple axis systems dispensing with the need for a superior intelligent control unit.

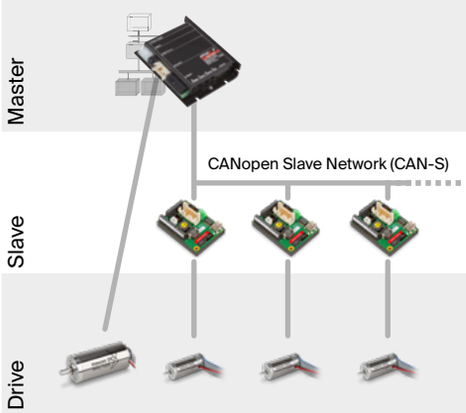
Via the CAN Bus all axes can be coordinated simultaneously. The combination with maxon motors produces drive systems for highly dynamic movements.

Standalone

Single Axis System

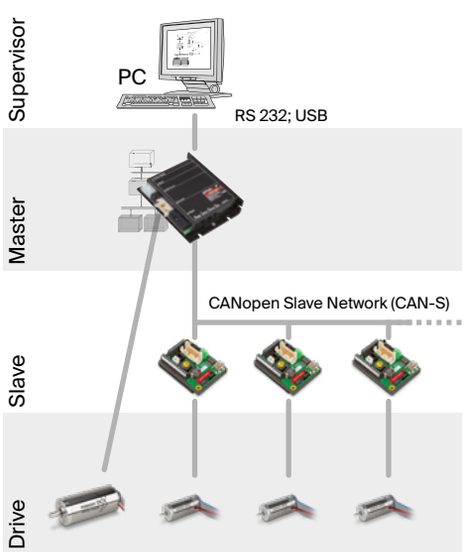


Multi Axis System

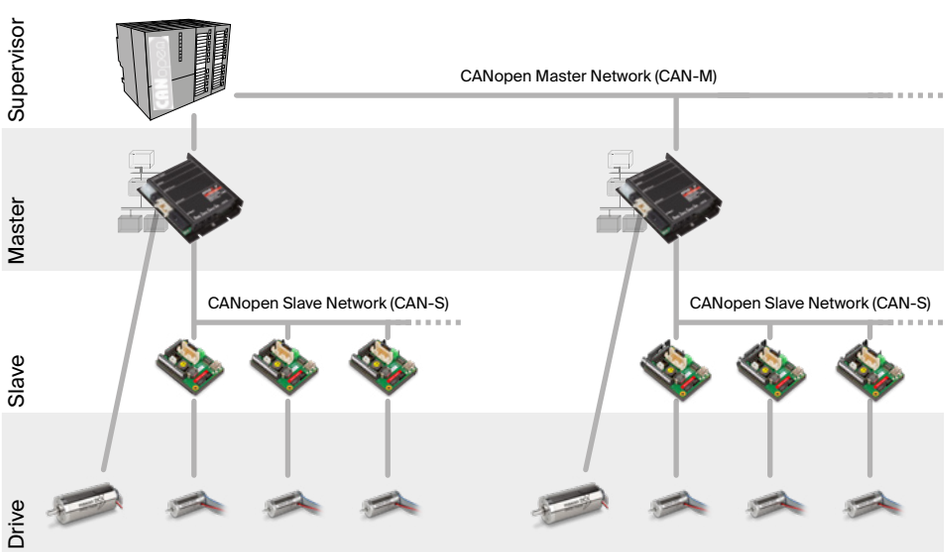


Supervisory Control

Single Standalone System



Multi Standalone System



Technology
The programming of applications complies with IEC 61131-3 standard. A non-volatile flash memory is used for saving. The three-stage code optimization produces IEC 61131-3 programs adjusted for the application's needs; optimized by memory, performance or a combination of both.

EPOS Studio – programming according to IEC 61131-3
Editors (ST, IL, FBD, LD, SFC) of the powerful "EPOS Studio" tool are available for programming according to IEC 61131-3. The integrated project browser shows all network resources. Complex programs with a large number of decentralized controls can be optimally managed with it. Drive systems are configured and networked quickly using intelligent step-by-step wizards.

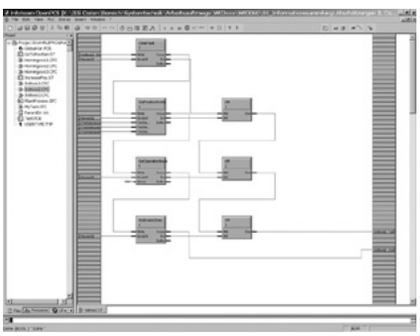
motion control library
The complexity and development costs of drive systems are substantially reduced. The Motion Firmware Library was implemented according to the widly-used motion control Standard. Standardized function blocks make implementation easy.

maxon utility library
Thanks to the additional maxon user library, the programming of recurring motion control tasks is simplified. By means of the "Best Practice" programs and the numerous applications examples, purposeful IEC 61131-3 application programs can be compiled.

Technical data page 504

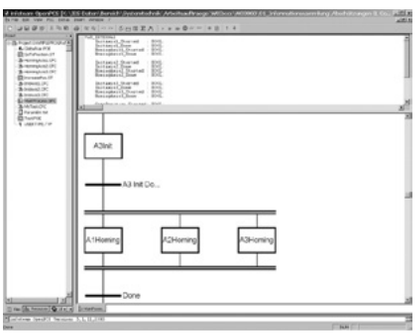
Performance features
- 32 bit host processor, 60 MHz
- 1 MB memory, with 768 KB free user program memory
- typicaly 2.5 ms / 5000 lines IL
- 4 KB non-volatile memory
- Digital motion control signal processor

Software features
- Windows-based development environment
- IEC 61131-3 programming languages (ST, IL, FBD, LD, SFC)
- IEC 61131-3 standard libraries
- Motion control function blocks
- maxon utility function block library
- CANopen function block library
- User libraries
- Network variables and data exchange
- Online debugger with break points and watch variables
- Axis configuration and parameterization
- Online help



FBD Editor

ST Editor



SFC Editor

Motion firmware library
- Drive control
- Referencing (Homing)
- Speed control
- Positioning absolute and relative
- Error Management
- Parameter Handling

Motion utility library
- Inputs and Outputs
- Error Handling
- Object Dictionary Access
- Homing Parameter
- Data Handling

EPOS2 P Programmable Positioning Controller Data

CANopen

USB RS232 GUI

EPOS2 P 24/5
Matched with DC brush motors with encoder or brushless EC motors with Hall sensors and encoder to 120/240 watts.

Controller versions	
	CANopen Master (programmable)
Electrical data	
Operating voltage V_{CC}	11 - 24 VDC
Logic supply voltage V_C (optional)	11 - 24 VDC
Max. output voltage	0.9 x V_{CC}
Max. output current I_{max} (<1 s)	10 A
Continuous output current I_{cont}	5 A
Switching frequency of power stage	50 kHz
Sample rate of PI - current controller	10 kHz
Sample rate of PI - speed controller	1 kHz
Sample rate of PID - positioning control	1 kHz
Max. speed (1 pole pair)	25 000 rpm (sinusoidal); 100 000 rpm (block)
Built-in motor choke per phase	15 µH / 5 A
Input	
Hall sensor signals	H1, H2, H3
Encoder signals	A, A\, B, B\, I, I\ (max. 5 MHz)
Digital inputs	6 (TTL and PLC level)
Analog inputs	2 12-bit resolution, 0...+5 V
CAN-ID (CAN node identification)	Configurable with DIP switch 1...7
Output	
Digital outputs	4
Encoder voltage output	+5 VDC, max. 100 mA
Hall sensor voltage output	+5 VDC, max. 30 mA
Auxiliary voltage output	V_{CC}, max. 1300 mA
Interface	
RS232	RxD; TxD (max. 115 200 bit/s)
CAN	high; low (max. 1 Mbit/s)
USB 2.0/3.0	Data+; Data- (full speed)
Indicator	
Operating/Error/Program	green LED, red LED, blue LED
Environmental conditions	
Temperature – Operation	-10...+55°C
Temperature – Extended range	+55...+83°C; Derating: -0.179 A/°C
Temperature – Storage	-40...+85°C
Humidity (condensation not permitted)	5...90%
Mechanical data	
Weight	Approx. 180 g
Dimensions (L x W x H)	105 x 83 x 24 mm
Mounting	Flange for M3-screws
Part numbers	
	378308 EPOS2 P 24/5
Accessories	
	309687 DSR 50/5 Shunt regulator
	Order accessories separately, see page 512

Operating modes
CANopen Profile Position, Profile Velocity- and Homing Mode
Position, Velocity and Current Mode
Path generating with trapezoidal or sinusoidal profiles
Feed forward for velocity and acceleration
Interpolated Position Mode (PVT)
Sinusoidal or block commutation for EC motors
Communication
Programming interface (Windows) via USB 2.0/3.0 or RS232
Communication via CANopen, RS232 or USB 2.0/3.0 maxon protocol
Inputs / Outputs
Free configurable digital inputs e.g. for limit switches and reference switches
Free configurable digital outputs e.g. for holding brakes
Free analog inputs
Available software
EPOS Studio programming according to IEC 61131-3
IEC 61131-3 standard libraries
motion control library
maxon utility function block library
CANopen function block library
maxon utility library
Application Examples
Best Practice Examples
Firmware
Available documentation
Getting Started
Cable Starting Set
Hardware Reference
Firmware Specification
Programming Reference
Application Notes
Cable
A comprehensive range of cables is available as an option. Details can be found on page 512.

I want the whole package!

Do you need a powerful, smart, and reliable drive system? One that comes with an electric motor, gearhead, controller, housing, connectors, software, and more? Then contact our specialists: **systems.maxongroup.com**

Precision Drive Systems

maxon

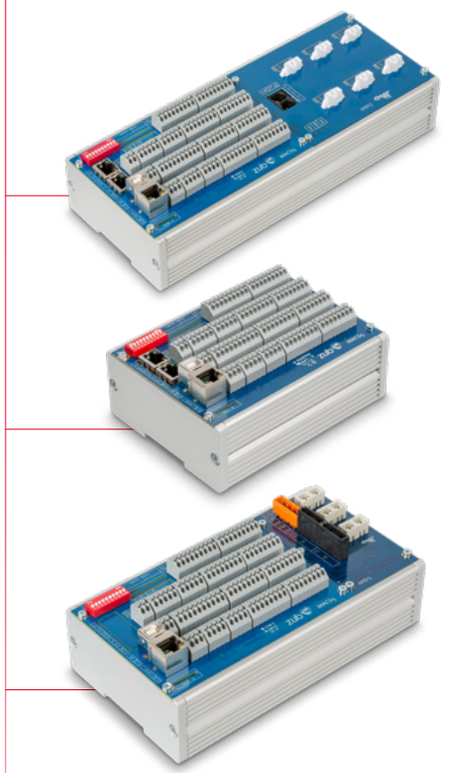
Multi-axis Motion-Controller Summary

CANopen

Solutions optimized for less complex or cost-sensitive applications:

- MiniMACS
- MACS5-AMP3-Lite
- MACS5-AMP3-Lite-HP

EtherCAT CANopen



Solutions for high flexibility:

- MACS5
- MACS5-AMP1 and MACS5-AMP2

- Variants with integrated amplifiers (50 V/up to 10 A/30 A) and various encoder inputs (also absolute)

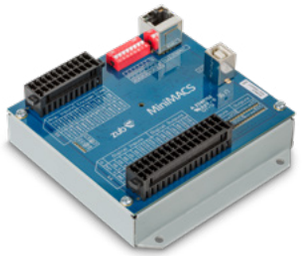
EtherCAT CANopen PROFINET

Solutions for highest performance:

- MasterMACS

- Most powerful motion controller
- Various fieldbus interfaces (Ethernet, 2 x CANopen, EtherCAT master, EtherCAT slave, Profinet on request etc.)

MiniMACS Data
Programmable motion controller



MiniMACS
The MiniMACS controllers are fully programmable motion controllers. They are suitable for less complex applications that still require compact dimensions.

Controller versions	
	CANopen Master/Slave, Standalone with APOSS® win
Features	
Motion features	Trapezoidal, jerk limited, CAM, synchronous travel
Profile generator cycle	1 kHz (1 ms)
Sampling rate of PID positioning controller with speed and acceleration feed-forward control	1 kHz (1ms)
Maximum number of axes	3
Web server (visualization)	–
Expandable memory	–
Electrical data	
Logic supply voltage V_C	18 - 30 VDC
Inputs	
Digital inputs	16 (PLC level)
Analog inputs	6 (12-bit resolution, 0...10 V); alternative analog option IO1 or IO2 (see MACS5)
Hall sensor signals	–
CAN-ID (CAN node identification)	configurable with DIP switch
Output	
Digital output	14 (max. 100 mA per output)
Analog output	option IO1
Configurable with DIP switch	+5 VDC, max. 200 mA
Interfaces	
Profinet	–
CAN	1 high; low (max. 1 Mbit/s)
RS232 / RS485	–
EtherCAT-Master / EtherCAT-Slave	–
Ethernet	1
USB 2.0	1 Data+; Data- (Full Speed)
Encoder inputs	1
Digital incremental	1 (differential, max. 5 MHz)
Hiperface/Endat	–
Encoder outputs	
Encoder TTL outputs	–
Indicator	
LEDs	37 (status, USB, IO)
Display	–
Environmental conditions	
Temperatrue – Operation	0...+40°C
Temperature – Storage	-20...+85°C
Humidity (condensation not permitted)	20...80%
Mechanical data	
Weight	500 / 300 g (DIN/compact housing)
Dimensions (L x W x H)	108 x 108 x 67 / 116 (98) x 98 x 42 mm
Mounting	DIN mounting / compact housing
Ordering Information: Please contact your maxon sales engineer	

«There is no drive challenge that can't be solved»
Benefit from our expertise in control solutions for state-of-the-art drive technology in devices, machinery, and systems. With our products, complex challenges like highly dynamic multi-axis positioning or synchronization can be solved in a cost-effective and efficient manner. Our use of the licensefree APOSS® motion control programming language provides the versatility required to adapt our controllers perfectly to your needs.
In addition to standard products, we also offer the development of OEM custom solutions in the field of control technology and power electronics, as well as consulting and engineering services. Cost-optimized solutions and applicationspecific custom functions.

MACS5 Data
Programmable motion controller

MACS5 series
The MACS5 series motion controllers represent a flexible product series offering high-performance computing power, six encoder inputs and various options such as integrated amplifiers.

Controller versions	
	CANopen Master/Slave, EtherCAT Master/ Slave, Standalone with APOSS® win
Features	
Motion features	Trapezoidal, jerk limited, CAM, synchronous travel, path
Profile generator cycle	1 kHz (1 ms)
Sampling rate of PID positioning controller with speed and acceleration feed-forward control	1 kHz (1 ms)
Maximum number of axes	6
Web server (visualization)	yes
Expandable memory	SD-Card
Electrical data	
Logic supply voltage V_C	18 - 30 VDC
Inputs	
Digital inputs	16 (PLC level, 8 latch capable)
Analog inputs	6 (12-bit resolution, 0...10 V); alternative analog option IO1 or IO2
Hall sensor signals	yes (uses one encoder input)
CAN-ID (CAN node identification)	configurable with DIP switch
Output	
Digital output	8 (max. 100 mA per output)
Analog output	Option IO1
Encoder voltage output	+5 VDC, max. 200 mA per output, total 1 A
Interfaces	
Profinet	–
CAN	2 high; low (max. 1 Mbit/s)
RS232 / RS485	1 x RxD; TxD / 1 x Data+; Data-
EtherCAT-Master / EtherCAT-Slave	1 / 1 (optional)
Ethernet	1
USB 2.0	1 Data+; Data- (Full Speed)
Encoder inputs	max. 6
Digital incremental	6 (differential, max. 5 MHz)
SSI absolut	3 (39 kHz...5 MHz)
Analog incremental (sin/cos)	3 (max. 150 kHz)
Hiperface/Endat	–
Encoder outputs	
Encoder TTL outputs	3 (max. 625 kHz)
Indicator	
LEDs	32 (status, USB, EtherCAT, IO)
Environmental conditions	
Temperatrue – Operation	0...+40°C
Temperature – Storage	-20...+85°C
Humidity (condensation not permitted)	20...80%
Mechanical data	
Weight	ca. 800 g
Dimensions (L x W x H)	140 x 108 x 65 mm
Mounting	DIN mounting, standard rail mounting
Ordering Information: Please contact your maxon sales engineer	

Options

Amplifier AMP1
Operating voltage V_{cc}: 12 - 50 VDC
6 DC / 4 EC (BLDC) / 3 stepper motors
Max. output voltage: 0.9 x V_{cc}
Max. output current I_{cont}: 2 A I_{max}: 10 A
Switching frequency of power stage: 48 kHz
Sampling rate of PI current controller: 8 kHz (125 µs)
Sampling rate of PI speed controller: 1 kHz (1 ms)
Amplifier AMP2
Operating voltage V_{cc}: 12 - 50 VDC
6 DC / 4 EC (BLDC) / 3 stepper motors
Max. output voltage: 0.9 x V_{cc}
Max. output current I_{cont}: 10 A I_{max}: 30 A
Switching frequency of power stage: 48 kHz
Sampling rate of PI current controller: 8 kHz (125 µs)
Sampling rate of PI speed controller: 1 kHz (1 ms)
EtherCAT-Interface IF1
Internal plug-in module EtherCAT slave (CoE, FoE) max. 100 Mbit/s
Analog Option IO1
1 analog input (12-bit resolution, -10...+10 V, max. 1 kHz)
±10 V reference voltage (max. 20 mA)
3 analog output (12-bit resolution, -10...+10 V, max. 20 mA, max. 1 kHz)
Analog Option IO2
6 analog input (14-bit resolution, 0...10 V, max. 1 kHz)
±10 V reference voltage (nominal 7 mA, max. 35 mA)

MACS5-AMP3-Lite/HP Data
Programmable motion controller

MACS5-AMP3-Lite/HP
motion controllers are OEM solutions in a particularly robust industrial housing. Do you need a motion controller in a special housing for your application? Contact us!

Controller versions	
	CANopen Master/Slave, EtherCAT Master, Standalone with APOSS® win
Features	
Motion features	Trapezoidal, jerk limited, CAM, synchronous travel, path
Profile generator cycle	1 kHz (1 ms)
Sampling rate of PID positioning controller with speed and acceleration feed-forward control	1 kHz (1 ms)
Maximum number of axes	3
Web server (visualization)	yes
Expandable memory	–
Electrical data	
Logic supply voltage V_C	18 - 30 VDC
Inputs	
Digital inputs	8 (PLC level, 4 latch capable)
Analog inputs	–
Hall sensor signals	yes (uses one encoder input)
CAN-ID (CAN node identification)	–
Output	
Digital output	4 (max. 100 mA per output)
Analog output	–
Encoder voltage output	+5 VDC, max. 200 mA per output, total 1 A
Interfaces	
Profinet	–
CAN	1 high; low (max. 1 Mbit/s)
RS232 / RS485	–
EtherCAT-Master / EtherCAT-Slave	1 / 0
Ethernet	1
USB 2.0	1 Data+; Data- (Full Speed)
Encoder inputs	max. 3 + 3
Digital incremental	3 (differential, max. 5 MHz)
SSI absolut	3 (39 kHz...5 MHz)
Analog incremental (sin/cos)	3 (max. 150 kHz)
Hiperface/Endat	–
Encoder outputs	
Encoder TTL outputs	3 (max. 625 kHz)
Indicator	
LEDs	4 (status)
Display	Option
Environmental conditions	
Temperatrue – Operation	0...+40°C
Temperature – Storage	-20...+85°C
Humidity (condensation not permitted)	20...80%
Mechanical data	
Weight	900 / 950 g (Lite/HP)
Dimensions (L x W x H)	180 x 108 x 80 mm
Mounting	Compact metal housing
Ordering Information: Please contact your maxon sales engineer	

Amplifier Lite (Standard)
Operating voltage V_{cc}: 12 - 50 VDC
3 DC / 2 EC (BLDC) / 1 stepper motor(s)
Max. output voltage: 0.9 x V_{cc}
Max. output current I_{cont}: 3.2 A I_{max}: 7 A
Switching frequency of power stage: 48 kHz
Sampling rate of PI current controller: 8 kHz (125 µs)
Sampling rate of PI speed controller: 1 kHz (1 ms)

Amplifier HP (Variant)
Operating voltage Vcc: 12 - 50 VDC
3 DC / 2 EC (BLDC) / 1 stepper motor(s)
Max. output voltage: 0.9 x V_{cc}
Max. output current I_{cont}: 4 A I_{max}: 8 A
Switching frequency of power stage: 48 kHz
Sampling rate of PI current controller: 8 kHz (125 µs)
Sampling rate of PI speed controller: 1 kHz (1 ms)

MasterMACS Data
Programmable motion controller

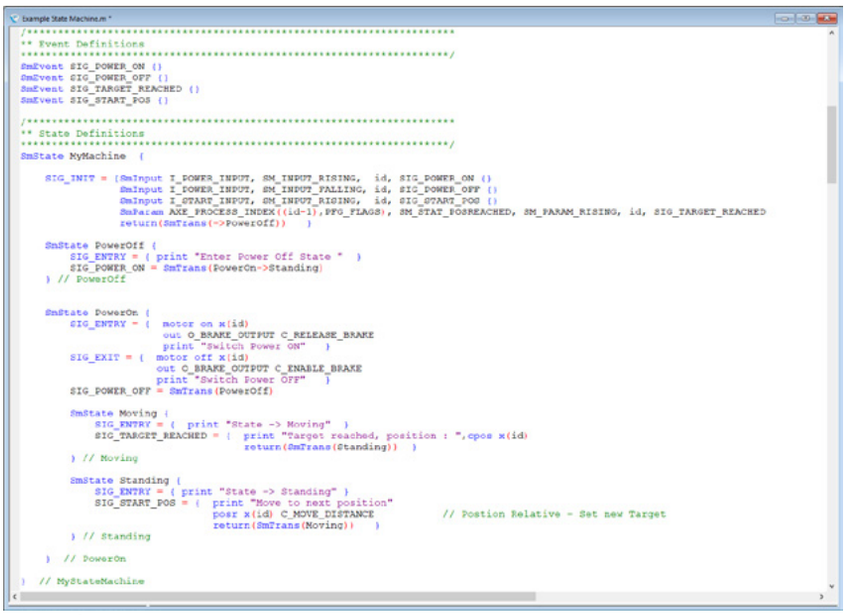
MasterMACS
rounds off the motion controller portfolio with the highest computing power and multiple integrated bus interfaces as standard.

Controller versions	
	CANopen Master/Slave, EtherCAT Master, EtherCAT Slave, Standalone with APOSS® win
Features	
Motion features	Trapezoidal, jerk limited, CAM, synchronous travel, path, kinematics
Profile generator cycle	1 kHz (1 ms)
Sampling rate of PID positioning controller with speed and acceleration feed-forward control	1 kHz (1 ms)
Maximum number of axes	32
Web server (visualization)	yes
Expandable memory	SD-Card
Electrical data	
Logic supply voltage V_C	18 - 30 VDC
Inputs	
Digital inputs	10 (PLC level)
Analog inputs	–
Hall sensor signals	–
CAN-ID (CAN node identification)	configurable with DIP switch
Output	
Digital output	4 (max. 100 mA per output)
Analog output	–
Encoder voltage output	+5 VDC, max. 200 mA
Profinet	on request
Interfaces	
CAN	2 high; low (max. 1 Mbit/s)
RS232 / RS485	1 x RxD; TxD / 1 x Data+; Data-
EtherCAT-Master / EtherCAT-Slave	1 / 1
Ethernet	1
USB 2.0	1 Data+; Data- (Full Speed)
Encoder inputs	1
Digital incremental	1 (differential, max. 5 MHz)
Hiperface/Endat	–
Encoder outputs	
Encoder TTL outputs	–
Indicator	
LEDs	10 (status, USB, EtherCAT)
Display	Option
Environmental conditions	
Temperatrue – Operation	0...+40°C
Temperature – Storage	-20...+85°C
Humidity (condensation not permitted)	20...80%
Mechanical data	
Weight	500 / 300 g (DIN/compact housing)
Dimensions (L x W x H)	108 x 108 x 67 / 125 (108) x 98 x 42 mm
Mounting	DIN mounting / compact housing
Ordering Information: Please contact your maxon sales engineer	

Data logger/web server
For development and analysis purposes, it is frequently helpful to collect, prepare and output data on drive systems.
Our MACS controllers provide easy options for high-performance data storage, be it on an internal SD card or via a connected PC tool. Relevant data can be recorded on a per-event basis or for long-term observation.
This data can be read out and analyzed at a later time. This flexibility makes it possible to use the MasterMACS purely as data collectors. An integrated web server provides the option of performing analysis and configuration via remote diagnostics.

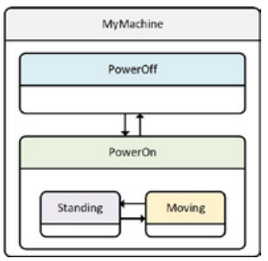
Programmable motion controllers
Application development

APOSS® win
APOSS® enables simplified implementation of complex motion control applications. The programming is performed in the high-level languages C, which has been supplemented with very powerful, specific motion control commands.



APOSS® IDE – Application Engineering

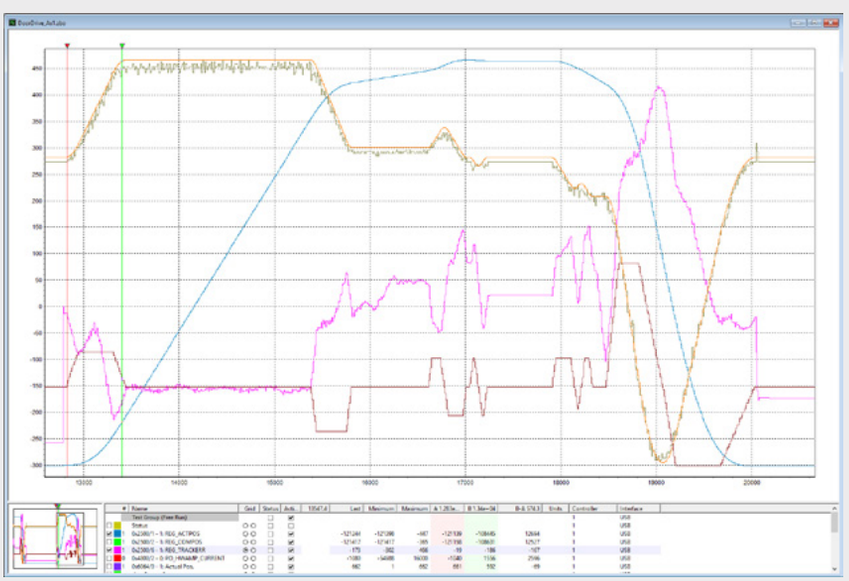
State machines
The development of extensive software systems requires a structured and modular procedure. It is essential to have an appropriate system architecture, including its components and the interfaces to the subsystems and system environment.



APOSS® makes it possible to create programs by means of hierarchical state machines. Thus comprehensive applications can be structured and developed in a transparent and serviceable way. Several state machines can be called up and processed in parallel.

Motion control functions
Comprehensive positioning and synchronization tasks are initiated with APOSS® using simple commands (e.g. POSA, POSR, SYNCP, SYNCV) and processed independently in the background.

- **Jerk-limited positioning**
  Profile motion with limited jerking. Jerk limiting can be individually defined for all four acceleration phases. Jerk-limited motion can be changed dynamically during the motion.
- **CAM profiles**
  Each axis can travel along an own CAM profile. CAM profiles can be combined in any way desired and dynamically calculated. CAM segments can be splines, polynomials up to the fifth order or straight lines.
- **Path motion**
  Path motion can be performed with constant or with maximum path speed, for any number of axes.
- **Synchronization tasks**
  Axis motion synchronized with a master axis, position synchronization, speed synchronization or position synchronization with marker correction. Each axis can be synchronized with another master.


APOSS® Oziloscope

Summary motor control

4-Q Servocontroller				Page
ESCON		466023	ESCON Module 24/2, for DC/EC motors, speed control (open loop/closed loop), current control, 2/6 A, 10–24 VDC	487
		403112	ESCON 36/2 DC, for DC motors, speed control (open loop/closed loop), current control, 2/4 A, 10–36 VDC	487
		414533	ESCON 36/3 EC, for EC motors, speed control (open loop/closed loop), current control, 2.7/9 A, 10–36 VDC	487
		446925	ESCON Module 50/4 EC-S, for sensorless EC motors, speed control (open loop/closed loop), 4/12 A, 10–50 VDC	487
		438725	ESCON Module 50/5, for DC/EC motors, speed control (open loop/closed loop), current control, 5/15 A, 10–50 VDC	487
		532872	ESCON Module 50/8, for DC/EC motors, speed control (open loop/closed loop), current control, 8/15 A, 10–50 VDC	488
		586137	ESCON Module 50/8 HE, for DC/EC motors, speed control (open loop/closed loop), current control, 8/15 A, 10–50 VDC	488
		409510	ESCON 50/5, for DC/EC motors, speed control (open loop/closed loop), current control, 5/15 A, 10–50 VDC	489
		422969	ESCON 70/10, for DC/EC motors, speed control (open loop/closed loop), current control, 10/30 A, 10–70 VDC	489

4-Q-DC Servoamplifier				
LSC	NRND	250521	LSC 30/2, linear 4-Q-Servoamplifier 30 V/2 A in module housing	
ADS	NRND	145391	ADS 50/5, pulsed (PWM) 4-Q-DC Servoamplifier 50 V/5 A in module housing	
	NRND	166143	ADS_E 50/5, pulsed (PWM) 4-Q-DC Servoamplifier 50 V/5 A in racket card (Eurocard)	

1-Q-EC Amplifier				
DECS	NRND	343253	DECS 50/5, digital 1-Q-EC Amplifier 50 V/5 A, sensorless, speed control, open electronic circuit board	
DEC		367661	DEC Module 24/2, digital 1-Q-EC Amplifier 24 V/2 A, speed control, OEM module	491
		380200	DEC Module 50/5, digital 1-Q-EC Amplifier 50 V/5 A, speed control, OEM module	491
	NRND	230572	DEC 50/5, digital 1-Q-EC Amplifier 50 V/5 A, speed control, current control, PWM operation	

4-Q-EC Servoamplifier				
DES	NRND	205679	DES 50/5, digital 4-Q-EC Servoamplifier 50 V/5 A, sinusoidal commutation	

Positioning				
EPOS4	**NEW**	638328	EPOS4 Micro 24/5 CAN, digital positioning controller, 5 A, 10–24 VDC	495
	NEW	654731	EPOS4 Micro 24/5 EtherCAT, digital positioning controller, 5 A, 10–24 VDC	495
		536630	EPOS4 Module 24/1.5, digital positioning controller, 1.5 A, 10–24 VDC	496
		534130	EPOS4 Module 50/5, digital positioning controller, 5 A, 10–50 VDC	496
		504384	EPOS4 Module 50/8, digital positioning controller, 8 A, 10–50 VDC	497
		504383	EPOS4 Module 50/15, digital positioning controller, 15 A, 10–50 VDC	497
	NEW	684519	EPOS4 Compact 24/5 EtherCAT 3-axes, digital positioning controller, 3 x 5 A, 10–24 VDC	497
		546714	EPOS4 Compact 24/1.5 CAN, digital positioning controller, 1.5 A, 10–24 VDC	498
		628092	EPOS4 Compact 24/1.5 EtherCAT, digital positioning controller, 1.5 A, 10–24 VDC	498
		541718	EPOS4 Compact 50/5 CAN, digital positioning controller, 5 A, 10–50 VDC	499
		628094	EPOS4 Compact 50/5 EtherCAT, digital positioning controller, 5 A, 10–50 VDC	499
		520885	EPOS4 Compact 50/8 CAN, digital positioning controller, 8 A, 10–50 VDC	499
		605298	EPOS4 Compact 50/8 EtherCAT, digital positioning controller, 8 A, 10–50 VDC	499
		520886	EPOS4 Compact 50/15 CAN, digital positioning controller, 15 A, 10–50 VDC	500
		605299	EPOS4 Compact 50/15 EtherCAT, digital positioning controller, 15 A, 10–50 VDC	501
		546047	EPOS4 50/5, digital positioning controller, 5 A, 10–50 VDC	501
		594385	EPOS4 70/15, digital positioning controller, 15 A, 10–70 VDC	501
EPOS2	NRND	380264	EPOS2 24/2 for EC motors, digital positioning controller, 2 A, 9–24 VDC	
	NRND	390003	EPOS2 24/2 for DC/EC motors, digital positioning controller, 2 A, 9–24 VDC	
	NRND	390438	EPOS2 24/2 for DC motors, digital positioning controller, 2 A, 9–24 VDC	
	NRND	530239	EPOS2 24/2 for DC(X) motors, digital positioning controller, 2 A, 9–24 VDC	
	NRND	360665	EPOS2 Module 36/2 OEM positioning controller plug-in module, 2 A, 11–36 VDC	
	NRND	392159	EPOS2 Module 24/3 OEM positioning controller plug-in module, 3 A, 11–24 VDC	
	NRND	367676	EPOS2 24/5, digital positioning controller, 5 A, 11–24 VDC	
	NRND	347717	EPOS2 50/5, digital positioning controller, 5 A, 11–50 VDC	
	NRND	375711	EPOS2 70/10, digital positioning controller, 10 A, 11–70 VDC	
EPOS2 P		378308	EPOS2 P 24/5, digital positioning controller, programmable, 5 A, 11–24 VDC	504
MAXPOS	NRND	447293	MAXPOS 50/5, digital positioning controller, 5 A, 10–50 VDC	

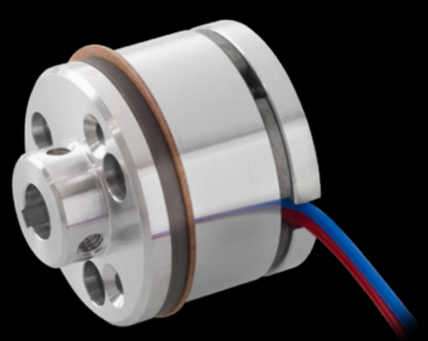
Summary motor control Accessories

Backplane		
NRND	166873	Backplane with screw type terminal block to ADS_E 50/5 (166143) and ADS_E 50/10 (168049)
Front panel		
NRND	167850	Front panel 3HE / 5TE to ADS_E 50/5 (166143)
Motor choke		
	137303	Choke module, 3 x 0.25 mH, 5.0 A, L x W x H (90 x 70 x 49 mm) with screw type terminal block
	347919	Choke module, 3 x 0.1 mH, 10.0 A, L x W x H (90 x 70 x 49.7 mm) with screw type terminal block
Cable		
	403957	Power Cable (length 1.5 m) to 403112, 414533
	403962	DC Motor Cable (length 1.5 m) to 403112
	403964	I/O Cable 7core (length 1.5 m) for analog I/Os to 403112, 414533
	403965	I/O Cable 6core (length 1.5 m) for digital I/Os to 403112, 414533
	403968	USB Type A - micro B Cable (length 1.5 m) to 403112, 409510, 414533, 422969, 438725, 446925, 447293, 466023, 504383, 504384, 520885, 520886, 534130, 536630, 541718, 546047, 546714, 594385, 605298, 605299, 628092, 628094, 684519
	275829	Power Cable (length 3 m) to 347717, 361435, 367676, 375711, 378308, 407582, 447293, 520884, 520885, 520886, 546047, 594385, 604594, 605298, 605299, 684519
	520850	Power Cable High Current (length 3 m) to 520884, 520885, 520886, 594385, 604594, 605298, 605299, 684519
	275851	Motor Cable (length 3 m) to 347717, 361435, 367676, 375711, 378308, 407582, 447293, 520885, 520886, 534133, 541718, 546047, 594385, 604594, 605298, 605299, 620044, 628094, 684519
	520851	Motor Cable High Current (length 3 m) to 520884, 520886, 594385, 604594, 605299
NRND	303490	DC Motor Cable (length 3 m) to 390003
	275878	Hall Sensor Cable (length 3 m) to 347717, 361435, 367676, 375711, 378308, 407582, 447293, 520884, 520885, 520886, 534133, 541718, 546047, 594385, 604594, 605298, 605299, 620044, 628094, 684519
NRND	302948	Motor/Hall Sensor Cable (length 3 m) to 390003
	275934	Encoder Cable (length 3 m) to 347717, 361435, 367676, 375711, 378308, 380264, 390003, 390438, 403112, 407582, 409510, 422969, 438779, 447293, 486400, 520884, 520885, 520886, 534133, 536997, 541718, 546047, 546714, 594385, 604594, 605298, 605299, 620044, 620048, 628092, 628094
NRND	275932	Signal Cable 16core (length 3 m) to 347717, 361435, 367676, 375711, 378308, 390003
NRND	300586	Signal Cable 6x2core (length 3 m) to 347717, 375711
NRND	350390	Signal Cable 4x2core (length 3 m) to 347717
NRND	378173	Signal Cable 3x2core (length 3m) to 375711
	520854	Signal Cable 7core (length 3 m) for analog I/Os with 520884, 520885, 520886, 534133, 536997, 541718, 546047, 546714, 594385, 604594, 605298, 605299, 620044, 620048, 628092, 628094, 684519
	520853	Signal Cable 8core (length 3 m) for digital I/Os and STO with 520884, 520885, 520886, 534133, 536997, 541718, 546047, 546714, 594385, 604594, 605298, 605299, 620044, 620048, 628092, 628094, 684519
NRND	275900	RS232-COM Cable (length 3 m) to 347717, 361435, 367676, 375711, 378308, 390003
	520856	RS232-COM Cable (length 3 m) to 520884, 520885, 520886, 534133, 536997, 541718, 546047, 546714, 594385
NRND	350392	USB Type A - B Cable (length 3 m) to 347717, 361435
NRND	370513	USB Type A - mini B Cable (length 3 m) to 367676, 375711, 378308, 390438, 380264, 390003
NRND	275908	CAN-COM Cable (length 3 m) to 347717, 361435, 367676, 375711, 378308, 390003
	520857	CAN-COM Cable (length 3 m) to 520884, 520885, 520886, 534133, 536997, 541718, 546047, 546714, 594385
NRND	275926	CAN-CAN Cable (length 3 m) to 347717, 361435, 367676, 375711, 378308, 390003
	520858	CAN-CAN Cable (length 3 m) to 520884, 520885, 520886, 534133, 536907, 541718, 546047, 546714, 594385
NRND	319471	CAN-Y Cable to 390003, 378308
	422827	Ethernet Cable (length 2 m) to 447293, 546047, 594385, 604594, 605298, 605299, 620044, 620048, 628092, 628094, 684519
NRND	451290	Sensor Cable 5x2core (length 3 m) to 447293
	520852	Sensor Cable 5x2core (length 3 m) to 520884, 520885, 520886, 534133, 536907, 541718, 546047, 546714, 594385, 604594, 605298, 605299, 620044, 620048, 628092, 628094, 684519
NRND	451291	Signal Cable 12core (length 3 m) to 447293
NRND	451292	Signal Cable 8core (length 3 m) to 447293
	404404	ESCON 36/2 DC Connector Set to 403112
	425255	ESCON 36/3 EC Connector Set to 414533
NRND	303807	EPOS2 24/2 Connector Set to 390003
NRND	351061	EPOS2 50/5 Connector Set to 347717
NRND	384915	EPOS2 24/5 Connector Set to 367676, 378308
NRND	381405	EPOS2 70/10 Connector Set to 375711
	520859	EPOS4 Connector Set to 520884, 520885, 520886, 534133, 536997, 541718, 546047, 546714, 594385, 604594, 605298, 605299, 620044, 620048, 628092, 628094
NRND	451746	MAXPOS 50/5 Connector Set to 447293

Summary motor control Accessories

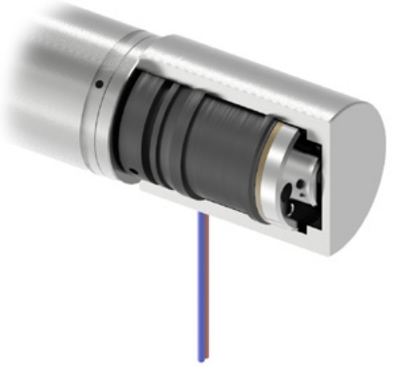
Adapter			
		220300	Adapter 11-pole flexprint connector to 8-pole screw terminal, for use with motors EC 10/13, EC 20/32/45 flat
		220310	Adapter 4-pole flexprint connector to 4-pole screw terminal, for use with EC micro motors without Hall sensors
		425931	Adapter 8-pole flexprint connector to 8-pole screw terminal, for use with motors ECX 6, ECX 8, EC 9.2 flat
		498157	Adapter Micromotor for use with motors ECX 6/8 and RE 6/8 with encoder (flexprint connector) or cable version
		473103	Adapter 6-pole flexprint connector to 6-pole screw terminal, for use with encoder 8 OPT
		223774	Adapter 10-pole spring contact strip (DIN 41651) to 8-pole screw terminal
		262359	Adapter 10-pole pin header (DIN 41651) to 10-pole screw terminal
		459875	Adapter encoder connector 2.54 mm pitch to 2.54 mm pitch (DIN 41651) with spring terminal for motor connections
		405120	Adapter encoder connector 1.27 mm pitch to 2.54 mm pitch (DIN 41651) with spring terminal for motor connections
		549609	Adapter encoder connector 1.27 mm pitch to 2.54 mm pitch (DIN 41651)
		488167	Adapter EASY Absolute to 6-pole screw terminal for use with encoder ENX 10/16 EASY Absolute
		418719	Adapter BLACK FPC11poles, for use with motors EC 10/13, EC 20/32/45 flat with 380264 and 414533
		418723	Adapter BLUE FPC8poles, for use with motors ECX 6, ECX 8, EC 9.2 flat with 380264 and 414533
	NRND	418721	Adapter GREEN FPC8poles, for use with motors EC 6 (1.2 W), EC 10 flat with 380264 and 414533
	NEW	506579	Adapter 10-pole flexprint connector to pin header (DIN 41651), for use with ENX 10 EASY with FFC cable
Accessories			
		586142	ESCON Module 50/8 Thermal Pad
	NEW	590738	EPOS4 Module SMT socket 2 x 23 poles, matching connector for PCB designs suitable for 536630, 534130
	NEW	677324	EPOS4 Micro SMT socket 2 x 40 poles, matching connector for PCB designs suitable for 638328, 654731
Shunt regulators			
		309687	DSR 50/5, shunt regulator 27 VDC and 56 VDC (selectable), P_{max} 300 W, P_{cont} 10 W
		235811	DSR 70/30, shunt regulator 12-75 VDC (adjustable), P_{max} 475 W, P_{cont} 25 W, module housing 180 x 103 x 26 mm
Starter kits, Eva boards, motherboards, Connector boards			
DEC		370652	DEC Module Evaluation Board, with switch, LED, potentiometer etc., for use with 367661 and 380200
ESCON		486400	ESCON Module 24/2 Motherboard with pluggable screw terminal block, for use with 466023
		438779	ESCON Module Motherboard with pluggable screw terminal block, for use with 438725
		586048	ESCON Module 50/8 Motherboard with pluggable screw terminal block, for use with 532872, 586137
		450237	ESCON Module Motherboard Sensorless with pluggable screw terminal block, for use with 446925
EPOS2	NRND	363407	EPOS2 Module 36/2 Starter Kit, consisting of 361435, 360665, 275829, 275851, 275878, 275934, 275932, 350392
	NRND	361435	EPOS2 Module Evaluation Board, 1-axis (with switch, LED, potentiometer and connector) for use with 360665
	NRND	407582	EPOS2 Module Motherboard, 1 to max. 11 axes, for use with 360665 (including 1 each red & black Power Link connector and CAN-link cable) Optional accessories:
	NRND		407583 EPOS2 Motherboard USB Module (incl. 4-wire connection leads l = 0.25 m, 2 x M3 screws)
	NRND		407584 EPOS2 Motherboard RS232 Module (incl. 6-wire connection leads l = 0.25 m, 2 x M3 screws)
	NRND		407585 EPOS2 Motherboard I/O Expander Module (2 x M3 screws)
	NRND		423536 EPOS2 Motherboard Dual Encoder Module (2 x M3 screws)
	NRND		423507 EPOS2 Motherboard Power Cable (l = 1 m) for use with 407582
	NRND		423526 EPOS2 Motherboard USB type A Cable (l = 1.5 m) for use with 407583
	NRND		423530 EPOS2 Motherboard RS232 DB9 Cable (l = 1 m) for use with 407584
EPOS2 P		327460	EPOS2 P 24/5 Starter Kit, consisting of EPOS2 P 24/5, EC motor with encoder, power supply, I/O board, cables
EPOS4		604594	EPOS4 CB Power EtherCAT, connector board including STO Idle Connector, compatible with 504383 and 504384
		520884	EPOS4 CB Power CAN, connector board including STO Idle Connector, compatible with 504383 and 504384
		620044	EPOS4 CB 50/5 EtherCAT, connector board including STO Idle Connector, compatible with 534130
		534133	EPOS4 CB 50/5 CAN, connector board including STO Idle Connector, compatible with 534130
		620048	EPOS4 CB 24/1.5 EtherCAT, connector board including STO Idle Connector, compatible with 536630
		536997	EPOS4 CB 24/1.5 CAN, connector board including STO Idle Connector, compatible with 536630
	NEW	638677	EPOS4 EB Micro, Evaluation Board compatible with 638328, 654731
	NEW	659508	EPOS4 MB Micro EtherCAT 3-axes, Motherboard compatible with 654731
Extension Cards			
EPOS4		581245	EPOS4 EtherCAT Card for use with 536630, 546047, 534130, 504384, 504383, 594385

maxon accessories & batteries



Useful parts complete maxon's full range of drive technology products. Brakes may only be assembled with motors in the delivery plant.

Brake AB 20 24 VDC, 0.1 Nm



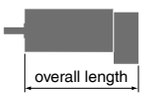
Important Information

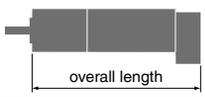
- Permanent magnet – single-face brake for DC (dry operation). Braking in unpowered condition.
- Holding brake, prevents rotation of the shaft at standstill or with turned off motor power.
- Not suitable for dynamic braking.
- Schematic image: does not necessarily reflect the delivery state.

Stock program
Standard program
Special program (on request)

Part Numbers

Type	301212	301213





maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Sensor	Page	∅ AB [mm]	Overall length [mm] / • see Gearhead	
EC-max 22, 12 W	238					22	67.8	
EC-max 22, 12 W	238	GP 22, 0.5 - 3.4 Nm	377-378			22	•	
EC-max 22, 12 W	238	KD 32	394			22	•	
EC-max 22, 12 W	238	GP 22 S	414/415			22	•	
EC-max 22, 25 W	239					22	84.2	
EC-max 22, 25 W	239	GP 22, 0.5 - 3.4 Nm	378			22	•	
EC-max 22, 25 W	239	GP 32, 1 - 6 Nm	388			22	•	
EC-max 22, 25 W	239	KD 32	394			22	•	
EC-max 22, 25 W	239	GP 32 S	417-421			22	•	
EC-max 30, 40 W	240					30		77.6
EC-max 30, 40 W	240	GP 32, 1.0 - 8.0 Nm	388/391			30		•
EC-max 30, 40 W	240	KD 32, 1.0 - 4.5 Nm	394			30		•
EC-max 30, 40 W	240	GP 32 S	417-421			30		•
EC-max 30, 40 W	240			HEDL 5540	475	30		98.4
EC-max 30, 40 W	240	GP 32, 1.0 - 8.0 Nm	388/391	HEDL 5540	475	30		•
EC-max 30, 40 W	240	KD 32, 1.0 - 4.5 Nm	394	HEDL 5540	475	30		•
EC-max 30, 40 W	240	GP 32 S	417-421	HEDL 5540	475	30		•
EC-max 30, 60 W	241					30		99.6
EC-max 30, 60 W	241	GP 32, 1.0 - 8.0 Nm	388/391			30		•
EC-max 30, 60 W	241	KD 32, 1.0 - 4.5 Nm	394			30		•
EC-max 30, 60 W	241	GP 42, 3 - 15 Nm	397			30		•
EC-max 30, 60 W	241			HEDL 5540	475	30		120.4
EC-max 30, 60 W	241	GP 32, 1.0 - 8.0 Nm	388/391	HEDL 5540	475	30		•
EC-max 30, 60 W	241	KD 32, 1.0 - 4.5 Nm	394	HEDL 5540	475	30		•
EC-max 30, 60 W	241	GP 42, 3 - 15 Nm	397	HEDL 5540	475	30		•
EC-4pole 30, 100 W	249					30		83.2
EC-4pole 30, 100 W	249	GP 32, 4.0 - 8.0 Nm	391			30		•
EC-4pole 30, 100 W	249	GP 42, 3 - 15 Nm	397			30		•
EC-4pole 30, 100 W	249			16 EASY/XT/Abs.	453-455	30		97.3
EC-4pole 30, 100 W	249	GP 32, 4.0 - 8.0 Nm	391	16 EASY/XT/Abs.	453-455	30		•
EC-4pole 30, 100 W	249	GP 42, 3 - 15 Nm	397	16 EASY/XT/Abs.	453-455	30		•
EC-4pole 30, 100 W	249			16 EASY Abs. XT	455	30		97.8
EC-4pole 30, 100 W	249	GP 32, 4.0 - 8.0 Nm	391	16 EASY Abs. XT	455	30		•
EC-4pole 30, 100 W	249	GP 42, 3 - 15 Nm	397	16 EASY Abs. XT	455	30		•
EC-4pole 30, 100 W	249			16 RIO	466	30		95.8
EC-4pole 30, 100 W	249	GP 32, 4.0 - 8.0 Nm	391	16 RIO	466	30		•
EC-4pole 30, 100 W	249	GP 42, 3 - 15 Nm	397	16 RIO	466	30		•
EC-4pole 30, 100 W	249			AEDL/HEDL	469/476	30		104
EC-4pole 30, 100 W	249	GP 32, 4.0 - 8.0 Nm	391	AEDL/HEDL	469/476	30		•
EC-4pole 30, 100 W	249	GP 42, 3 - 15 Nm	397	AEDL/HEDL	469/476	30		•

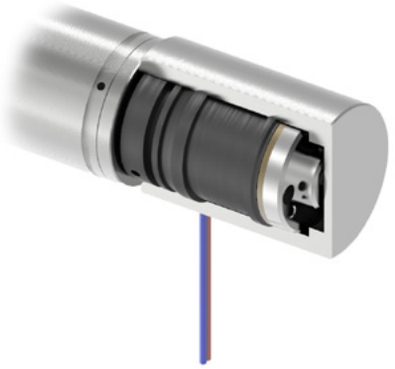
Technical Data

Max. permissible static torque at 20°C	0.1 Nm	Nominal voltage, smoothed	24 VDC ±10%
Mass inertia	1.8 gcm²	Resistance	R_{20} = 227 Ω ±6%
Max. speed	49 000 rpm	Duty cycle	100%
Weight	29 g	Reaction time – Coupling	≤ 12 ms
Ambient temperature range	-40...+100°C	– Opening	≤ 6 ms

Pin Allocation

Cable (AWG 26)	Designation
red	U_{Brake} + 24 VDC
blue	U_{Brake} GND
Min. cable length	350 mm

Brake AB 20 24 VDC, 0.1 Nm



Important Information

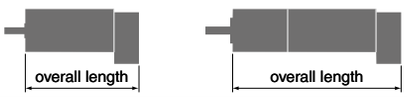
- Permanent magnet – single-face brake for DC (dry operation). Braking in unpowered condition.
- Holding brake, prevents rotation of the shaft at standstill or with turned off motor power.
- Not suitable for dynamic braking.
- Schematic image: does not necessarily reflect the delivery state.

Stock program
Standard program
Special program (on request)

Part Numbers

301212	301213

Type



maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Sensor	Page	∅ AB [mm]	Overall length [mm] / • see Gearhead
EC-4pole 30, 200 W	251					30	100.2
EC-4pole 30, 200 W	251	GP 32, 4.0 - 8.0 Nm	391			30	•
EC-4pole 30, 200 W	251	GP 42, 3 - 15 Nm	397			30	•
EC-4pole 30, 200 W	251			16 EASY/XT/Abs.	453-455	30	114.3
EC-4pole 30, 200 W	251	GP 32, 4.0 - 8.0 Nm	391	16 EASY/XT/Abs.	453-455	30	•
EC-4pole 30, 200 W	251	GP 42, 3 - 15 Nm	397	16 EASY/XT/Abs.	453-455	30	•
EC-4pole 30, 200 W	251			16 EASY Abs. XT	455	30	114.8
EC-4pole 30, 200 W	251	GP 32, 4.0 - 8.0 Nm	391	16 EASY Abs. XT	455	30	•
EC-4pole 30, 200 W	251	GP 42, 3 - 15 Nm	397	16 EASY Abs. XT	455	30	•
EC-4pole 30, 200 W	251			16 RIO	466	30	112.8
EC-4pole 30, 200 W	251	GP 32, 4.0 - 8.0 Nm	391	16 RIO	466	30	•
EC-4pole 30, 200 W	251	GP 42, 3 - 15 Nm	397	16 RIO	466	30	•
EC-4pole 30, 200 W	251			AEDL/HEDL	469/476	30	121
EC-4pole 30, 200 W	251	GP 32, 4.0 - 8.0 Nm	391	AEDL/HEDL	469/476	30	•
EC-4pole 30, 200 W	251	GP 42, 3 - 15 Nm	397	AEDL/HEDL	469/476	30	•

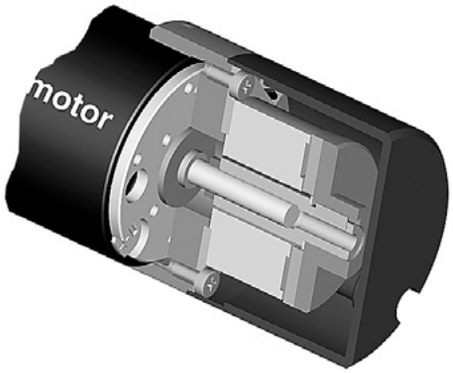
Technical Data

Max. permissible static torque at 20°C	0.1 Nm	Nominal voltage, smoothed		24 VDC ±10%	
Mass inertia	1.8 gcm²	Resistance		R_{20} = 227 Ω ±6%	
Max. speed	49 000 rpm	Duty cycle		100%	
Weight	29 g	Reaction time	– Coupling	≤ 12 ms	
Ambient temperature range	-40...+100°C		– Opening	≤ 6 ms	

Pin Allocation

Cable (AWG 26)	Designation
red	U_{Brake} + 24 VDC
blue	U_{Brake} GND
Min. cable length	350 mm

Brake AB 28 24 VDC, 0.4 Nm



Important Information

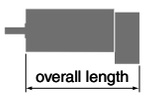
- Permanent magnet – single-face brake for DC (dry operation). Braking in unpowered condition.
- Holding brake, prevents rotation of the shaft at standstill or with turned off motor power.
- Not suitable for dynamic braking.
- It is possible to lower the voltage applied to the brake after it has been energized, for the purpose of reducing heat loss.
- Schematic image: does not necessarily reflect the delivery state.

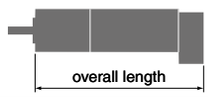
Stock program
Standard program
Special program (on request)

Part Numbers

301215

Type





maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Sensor	Page	∅ AB [mm]	Overall length [mm] / • see Gearhead
EC-max 40, 70 W	242					40	92.4
EC-max 40, 70 W	242	GP 42, 3 - 15 Nm	397			40	•
EC-max 40, 70 W	242			HEDL 5540	474	40	110.7
EC-max 40, 70 W	242	GP 42, 3 - 15 Nm	397	HEDL 5540	474	40	•
EC-max 40, 120 W	243					40	122.4
EC-max 40, 120 W	243	GP 52, 4 - 30 Nm	402			40	•
EC-max 40, 120 W	243			HEDL 5540	474	40	140.7
EC-max 40, 120 W	243	GP 52, 4 - 30 Nm	402	HEDL 5540	474	40	•

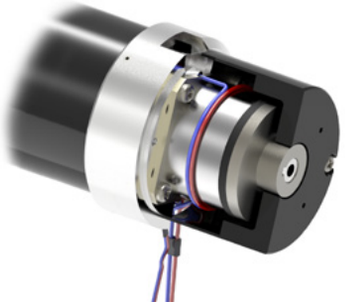
Technical Data

Max. permissible static torque at 20°C	0.4 Nm	Nominal voltage, smoothed		24 VDC ±10%
Mass inertia	10 gcm²	Resistance		R_{20} = 92.5 Ω ±6%
Max. speed	16 000 rpm	Duty cycle		100%
Weight	0.05 kg	Reaction time	– Coupling	≤ 13 ms
Ambient temperature range	-5...+85°C		– Opening	≤ 27 ms

Pin Allocation

Cable (AWG 26)	Designation
red	U_{Brake} + 24 VDC
blue	U_{Brake} GND
Min. cable length	350 mm

Brake AB 28 24 VDC, 0.4 Nm



Important Information

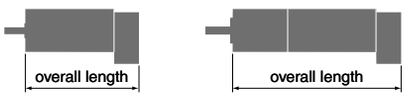
- Permanent magnet – single-face brake for DC (dry operation). Braking in unpowered condition.
- Holding brake, prevents rotation of the shaft at standstill or with turned off motor power.
- Not suitable for dynamic braking.
- It is possible to lower the voltage applied to the brake after it has been energized, for the purpose of reducing heat loss.
- Schematic image: does not necessarily reflect the delivery state.

Stock program
Standard program
Special program (on request)

Part Numbers

228384	228387

Type



maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Sensor	Page	∅ AB [mm]	Overall length [mm] / • see Gearhead	
RE 25, 20 W	135					40	77.1	
RE 25, 20 W	135	GP 22, 0.5 -1.0 Nm	375			40	•	
RE 25, 20 W	135	GP 26, 0.75 - 4.5 Nm	381			40	•	
RE 25, 20 W	135	GP 32, 0.75 - 4.5 Nm	383			40	•	
RE 25, 20 W	135	GP 32, 0.75 - 4.5 Nm	384			40	•	
RE 25, 20 W	135	GP 32, 1.0 - 6.0 Nm	387/394			40	•	
RE 25, 20 W	135	GP 32 S	416-420			40	•	
RE 25, 20 W	135			HED_ 5540	472/473	40		94.3
RE 25, 20 W	135	GP 22, 0.5 - 1.0 Nm	375	HED_ 5540	472/473	40		•
RE 25, 20 W	135	GP 26, 0.75 - 4.5 Nm	381	HED_ 5540	472/473	40		•
RE 25, 20 W	135	GP 32, 0.75 - 4.5 Nm	383	HED_ 5540	472/473	40		•
RE 25, 20 W	135	GP 32, 0.75 - 4.5 Nm	384	HED_ 5540	472/473	40		•
RE 25, 20 W	135	GP 32, 1.0 - 6.0 Nm	387/394	HED_ 5540	472/473	40		•
RE 25, 20 W	135	GP 32 S	416-420	HED_ 5540	472/473	40		•
RE 25, 20 W	136					40	88.6	
RE 25, 20 W	136	GP 26, 0.75 - 4.5 Nm	381			40	•	
RE 25, 20 W	136	GP 32, 0.75 - 4.5 Nm	383			40	•	
RE 25, 20 W	136	GP 32, 0.75 - 4.5 Nm	384			40	•	
RE 25, 20 W	136	GP 32, 1.0 - 6.0 Nm	387/394			40	•	
RE 25, 20 W	136	GP 32 S	416-420			40	•	
RE 25, 20 W	136			HED_ 5540	471/473	40		105.8
RE 25, 20 W	136	GP 26, 0.75 - 4.5 Nm	381	HED_ 5540	471/473	40		•
RE 25, 20 W	136	GP 32, 0.4 - 2.0 Nm	383	HED_ 5540	471/473	40		•
RE 25, 20 W	136	GP 32, 0.75 - 4.5 Nm	384	HED_ 5540	471/473	40		•
RE 25, 20 W	136	GP 32, 1.0 - 6.0 Nm	387/394	HED_ 5540	471/473	40		•
RE 25, 20 W	136	GP 32 S	416-420	HED_ 5540	471/473	40		•
RE 35, 90 W	139					40	107.1	
RE 35, 90 W	139	GP 32, 0.75 - 6.0 Nm	383-390			40	•	
RE 35, 90 W	139	GP 32, 4.0 - 8.0 Nm	391			40	•	
RE 35, 90 W	139	GP 42, 3 - 15 Nm	396			40	•	
RE 35, 90 W	139			HED_ 5540	471/473	40		124.3
RE 35, 90 W	139	GP 32, 0.75 - 6.0 Nm	383-390	HED_ 5540	471/473	40		•
RE 35, 90 W	139	GP 32, 4.0 - 8.0 Nm	391	HED_ 5540	471/473	40		•
RE 35, 90 W	139	GP 42, 3 - 15 Nm	396	HED_ 5540	471/473	40		•
RE 35, 90 W	139	GP 32 S	416-420			40	•	
RE 35, 90 W	139	GP 32 S	416-420	HED_ 5540	471/473	40		•
RE 40, 150 W	141					45	107.1	
RE 40, 150 W	141	GP 42, 3 - 15 Nm	396			45	•	
RE 40, 150 W	141	GP 52, 4 - 30 Nm	401			45	•	
RE 40, 150 W	141			HED_ 5540	471/473	45		124.3
RE 40, 150 W	141	GP 42, 3 - 15 Nm	396	HED_ 5540	471/473	45		•
RE 40, 150 W	141	GP 52, 4 - 30 Nm	401	HED_ 5540	471/473	45		•

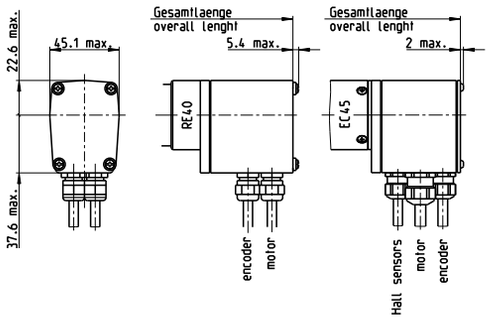
Technical Data

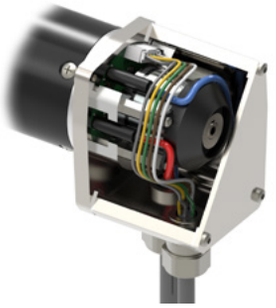
Max. permissible static torque at 20°C	0.4 Nm	Nominal voltage, smoothed		24 VDC ±10%	
Mass inertia	10 gcm²	Resistance		R_{20} = 92.5 Ω ±6%	
Max. speed	16000 rpm	Duty cycle		100%	
Weight	0.05 kg	Reaction time	– Coupling	≤ 13 ms	
Ambient temperature range	-5...+85°C		– Opening	≤ 27 ms	

Pin Allocation

Cable (AWG 26)	Designation
red	U_{Brake} + 24 VDC
blue	U_{Brake} GND
red	Motor+
black	Motor-
Min. cable length	350 mm

Brake AB 28 24 VDC, 0.4 Nm





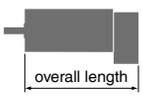
Important Information

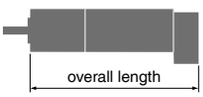
- Permanent magnet – single-face brake for DC (dry operation). Braking in unpowered condition.
- Holding brake, prevents rotation of the shaft at standstill or with turned off motor power.
- Not suitable for dynamic braking.
- It is possible to lower the voltage applied to the brake after it has been energized, for the purpose of reducing heat loss.
- Schematic image: does not necessarily reflect the delivery state.

Stock program
Standard program
Special program (on request)

Part Numbers	
228389	228390

Type





maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Sensor	Page	Overall length [mm] / • see Gearhead	
RE 40, 150 W	141					115.1	
RE 40, 150 W	141	GP 42, 3 - 15 Nm	396			•	
RE 40, 150 W	141	GP 52, 4 - 30 Nm	401			•	
RE 40, 150 W	141			HEDL 9140	478	135.6	
RE 40, 150 W	141	GP 42, 3 - 15 Nm	396	HEDL 9140	478	•	
RE 40, 150 W	141	GP 52, 4 - 30 Nm	401	HEDL 9140	478	•	
EC 45, 150 W	230						118.6
EC 45, 150 W	230	GP 42, 3 - 15 Nm	396				•
EC 45, 150 W	230	GP 52, 4 - 30 Nm	401				•
EC 45, 150 W	230			HEDL 9140	478		135.6
EC 45, 150 W	230	GP 42, 3 - 15 Nm	396	HEDL 9140	478		•
EC 45, 150 W	230	GP 52, 4 - 30 Nm	401	HEDL 9140	478		•
EC 45, 250 W	231						151.4
EC 45, 250 W	231	GP 42, 3 - 15 Nm	397				•
EC 45, 250 W	231	GP 52, 4 - 30 Nm	401				•
EC 45, 250 W	231	GP 62, 8 - 50 Nm	403				•
EC 45, 250 W	231			HEDL 9140	478		168.4
EC 45, 250 W	231	GP 42, 3 - 15 Nm	397	HEDL 9140	478		•
EC 45, 250 W	231	GP 52, 4 - 30 Nm	401	HEDL 9140	478		•
EC 45, 250 W	231	GP 62, 8 - 50 Nm	403	HEDL 9140	478		•

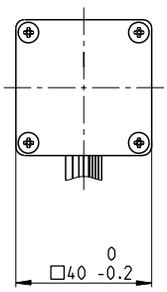
Technical Data

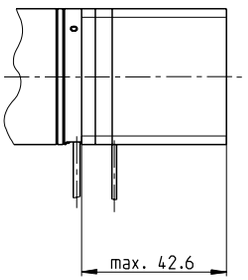
Max. permissible static torque at 20°C	0.4 Nm	Nominal voltage, smoothed	24 VDC ±10%
Mass inertia	10 gcm²	Resistance	R_{20} = 92.5 Ω ±6%
Max. speed	16 000 rpm	Duty cycle	100%
Weight	0.05 kg	Reaction time – Coupling	≤ 13 ms
Ambient temperature range	-5...+85°C	– Opening	≤ 27 ms

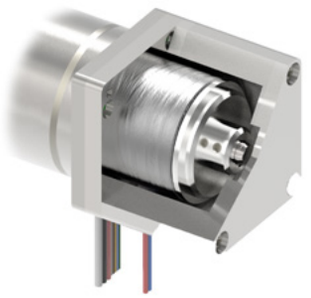
Pin Allocation

		from motor clamp	Designation
		RE 40	
Cable	green	(AWG 20)	U_{Brake} + 24 VDC
Cable	yellow	(AWG 20)	U_{Brake} GND
		EC 45	
Cable	No 4	(AWG 18)	U_{Brake} + 24 VDC
Cable	No 5	(AWG 18)	U_{Brake} GND
Min. cable length			500 mm

Brake AB 32 24 VDC, 0.4 Nm







Important Information

- Permanent magnet – single-face brake for DC (dry operation). Braking in unpowered condition.
- Holding brake, prevents rotation of the shaft at standstill or with turned off motor power.
- Not suitable for dynamic braking.
- It is possible to lower the voltage applied to the brake after it has been energized, for the purpose of reducing heat loss.

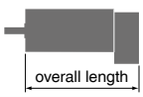
accessories

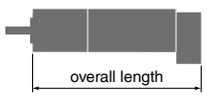
Stock program
Standard program
Special program (on request)

Part Numbers

392335

Type





maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Sensor	Page	Overall length [mm] / • see Gearhead
EC 40, 170 W	229					122.7
EC 40, 170 W	229	GP 42, 3 - 15 Nm	396			•
EC 40, 170 W	229	GP 52, 4 - 30 Nm	401			•
EC 40, 170 W	229			HED_ 5540	472/474	141.1
EC 40, 170 W	229	GP 42, 3 - 15 Nm	396	HED_ 5540	472/474	•
EC 40, 170 W	229	GP 52, 4 - 30 Nm	401	HED_ 5540	472/474	•

Technical Data

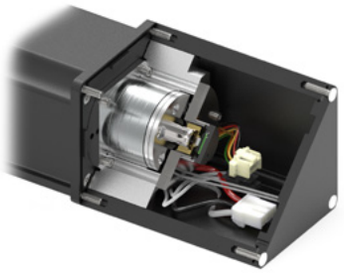
Max. permissible static torque at 20°C	0.4 Nm	Nominal voltage, smoothed		24 VDC ±10%
Mass inertia	19 gcm²	Resistance		R_{20} = 100 Ω ±7%
Max. speed	10 000 rpm	Duty cycle		100%
Weight	0.1 kg	Reaction time	– Coupling	≤ 13 ms
Ambient temperature range	-40...+100°C		– Opening	≤ 24 ms

Pin Allocation

Cable (AWG 24)	Designation
red	U_{Brake} + 24 VDC
blue	U_{Brake} GND
Min. cable length	350 mm

Brake AB 32 24 VDC, 0.4 Nm

NEW



Important Information

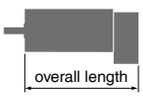
- Permanent magnet – single-face brake for DC (dry operation). Braking in unpowered condition.
- Holding brake, prevents rotation of the shaft at standstill or with turned off motor power.
- Not suitable for dynamic braking.

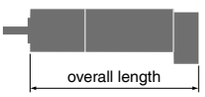
Stock program
Standard program
Special program (on request)

Part Numbers

x drives

Type





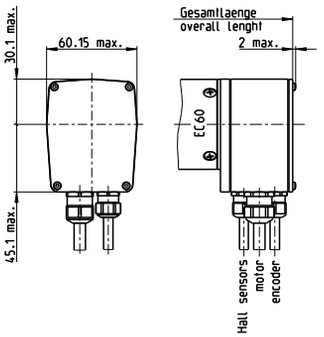
maxon Modular System

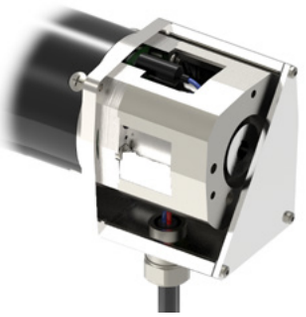
+ Drive	Page	+ Gearhead	Page	+ Sensor	Page	Overall length [mm] / • see Gearhead
IDX 56 M						online
IDX 56 L						online

+ Motor	Page	+ Gearhead	Page	+ Sensor	Page	Overall length [mm] / • see Gearhead
IDX 56 M						online
IDX 56 L						online

Technical Data				Pin Allocation
Max. permissible static torque at 20°C	1.0 Nm	Nominal voltage, smoothed	24 VDC -10...+6%	online
Mass inertia	29.6 gcm²	Resistance	R_{20} = 57.6 Ω ±7%	
Max. speed	10 000 rpm	Duty cycle	100%	
Weight	0.1 kg	Reaction time – Coupling	≤ 12 ms	
Ambient temperature range	-10...+85°C	– Opening	≤ 20 ms	

Brake AB 41 24 VDC, 2.0 Nm





Important Information

- Permanent magnet – single-face brake for DC (dry operation). Braking in unpowered condition.
- Holding brake, prevents rotation of the shaft at standstill or with turned off motor power.
- Not suitable for dynamic braking.

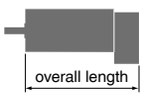
accessories

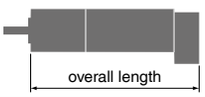
Stock program
Standard program
Special program (on request)

Part Numbers

228998

Type





maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Sensor	Page	Overall length [mm] / • see Gearhead
EC 60, 400 W	232					190.9
EC 60, 400 W	232	GP 81, 20 - 120 Nm	404			•
EC 60, 400 W	232			HEDL 9140	478	214.9
EC 60, 400 W	232	GP 81, 20 - 120 Nm	404	HEDL 9140	478	•

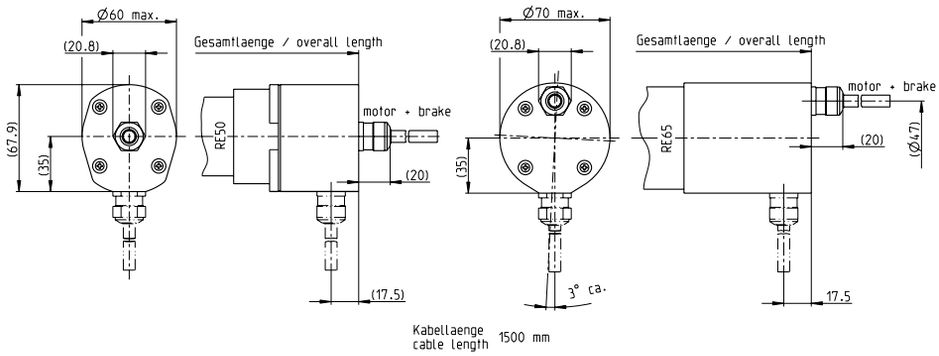
Technical Data

Max. permissible static torque at 20°C	2.0 Nm	Nominal voltage, smoothed		24 VDC -10 ... +6%
Mass inertia	45 gcm²	Resistance		R_{20} = 72 Ω ±7%
Max. speed	10 000 rpm	Duty cycle		100%
Weight	0.18 kg	Reaction time	– Coupling	≤ 2 ms
Ambient temperature range	-5...+85°C		– Opening	≤ 25 ms

Pin Allocation

		from motor clamp	Designation
Cable	red	No 4 (AWG 16)	U_{Brake} + 24 VDC
Cable	black	No 5 (AWG 16)	U_{Brake} GND
Min. cable length			500 mm

Brake AB 44 24 VDC, 2.5 Nm



Important Information

- Permanent magnet – single-face brake for DC (dry operation). Braking in unpowered condition.
- Holding brake, prevents rotation of the shaft at standstill or with turned off motor power.
- Not suitable for dynamic braking.
- It is possible to lower the voltage applied to the brake after it has been energized, for the purpose of reducing heat loss.
- Protection: IP54

Stock program
Standard program
Special program (on request)

Part Numbers		
Cable output axial	386052	385999
Cable output radial	386054	386000

Type

maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Sensor	Page	Overall length [mm] / • see Gearhead	
RE 50, 200 W	142					170.4	
RE 50, 200 W	142	GP 52, 4 - 30 Nm	401			•	
RE 50, 200 W	142	GP 62, 8 - 50 Nm	403			•	
RE 50, 200 W	142			HEDL 9140	479	183.4	
RE 50, 200 W	142	GP 52, 4 - 30 Nm	401	HEDL 9140	479	•	
RE 50, 200 W	142	GP 62, 8 - 50 Nm	403	HEDL 9140	479	•	
RE 65, 250 W	143						187.5
RE 65, 250 W	143	GP 81, 20 - 120 Nm	404				•
RE 65, 250 W	143			HEDL 9140	479		205.5
RE 65, 250 W	143	GP 81, 20 - 120 Nm	404	HEDL 9140	479		•

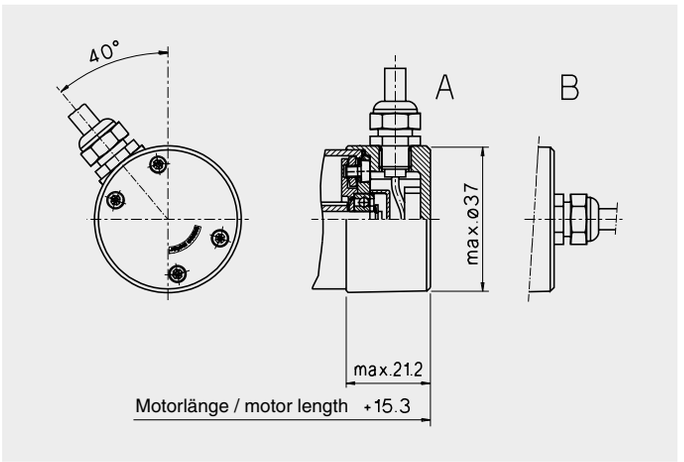
Technical Data

Max. permissible static torque at 20°C	2.5 Nm	Nominal voltage, smoothed	24 VDC ±10%
Mass inertia	90 gcm²	Resistance	R_{20} = 64 Ω ±7%
Max. speed	10 000 rpm	Duty cycle	100%
Weight	0.19 kg	Reaction time – Coupling	≤ 20 ms
Ambient temperature range	-40...+100°C	– Opening	≤ 35 ms

Pin Allocation

Cable (AWG 18)	Designation
white	Motor+
brown	Motor-
green	U_{Brake} + 24 VDC
yellow	U_{Brake} GND
Min. cable length	1490 mm

End Caps



End cap for maxon DC motor RE 35

Details for motor see page 139

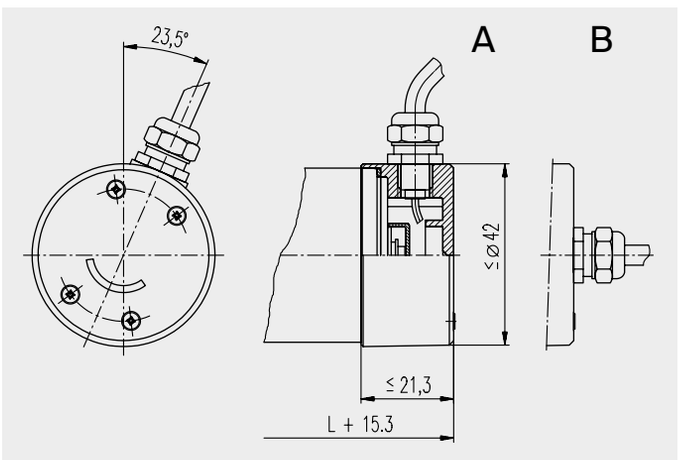
- Plastic housing
- Protection to IP54
- With 500 mm cable, AWG 20 (2 × 0.5 mm²) other lengths on request!
- Radial or axial cable outlet
- Assembly only by maxon motor. The shaft must be shortened.

Pin Allocation

Cable No.	Color	Motor
1	black	+ Pol
2	black	– Pol

Part Numbers

137235	**A**	End cap with radial cable outlet (500 mm)
137234	**B**	End cap with axial cable outlet (500 mm)



End cap for maxon DC motor RE 40

Details for motor see page 141

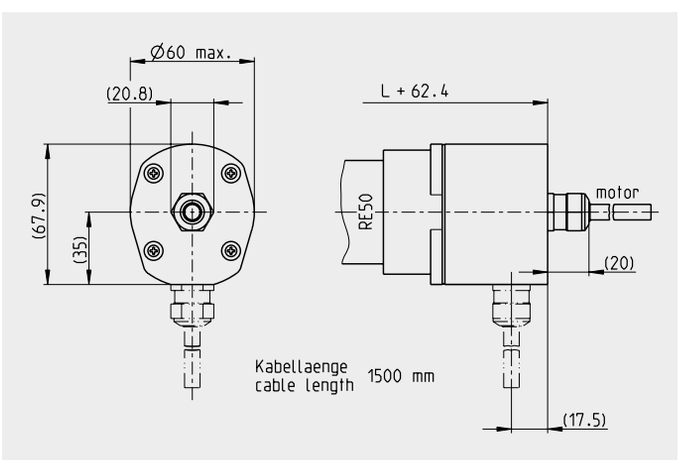
- Plastic housing
- Protection to IP54
- With 500 mm cable, AWG 20 (2 × 0.5 mm²) other lengths on request!
- Radial or axial cable outlet
- Assembly only by maxon motor. The shaft must be shortened.

Pin Allocation

Cable No.	Color	Motor
1	black	+ Pol
2	black	– Pol

Part Numbers

232341	**A**	End cap with radial cable outlet (500 mm)
232343	**B**	End cap with axial cable outlet (500 mm)



End cap for maxon DC motor RE 50

Details for motor see page 142

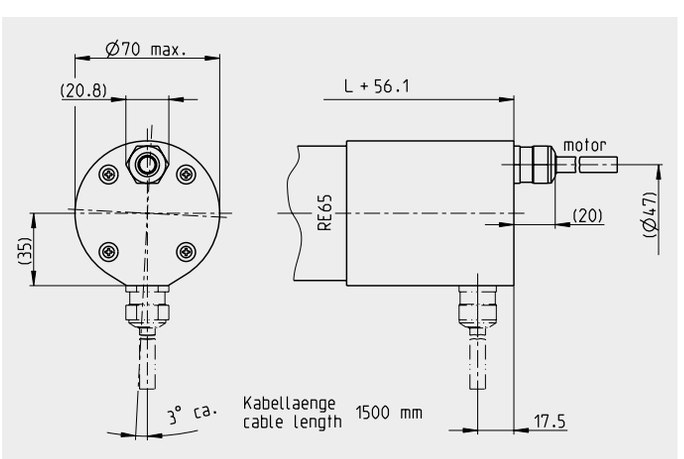
- Aluminium housing
- Protection to IP54
- With 1500 mm cable, AWG 18 (2 × 1.0 mm²) other lengths on request!
- Radial or axial cable outlet
- Assembly only by maxon motor.

Pin Allocation

Cable No.	Color	Motor
1	white	+ Pol
2	brown	– Pol

Part Numbers

386056	**A**	End cap with radial cable outlet (1500 mm)
386055	**B**	End cap with axial cable outlet (1500 mm)



End cap for maxon DC motor RE 65

Details for motor see page 143

- Aluminium housing
- Protection to IP54
- With 1500 mm cable, AWG 18 (2 × 1.0 mm²) other lengths on request!
- Radial or axial cable outlet
- Assembly only by maxon motor.

Pin Allocation

Cable No.	Color	Motor
1	white	+ Pol
2	brown	– Pol

Part Numbers

386004	**A**	End cap with radial cable outlet (1500 mm)
386003	**B**	End cap with axial cable outlet (1500 mm)

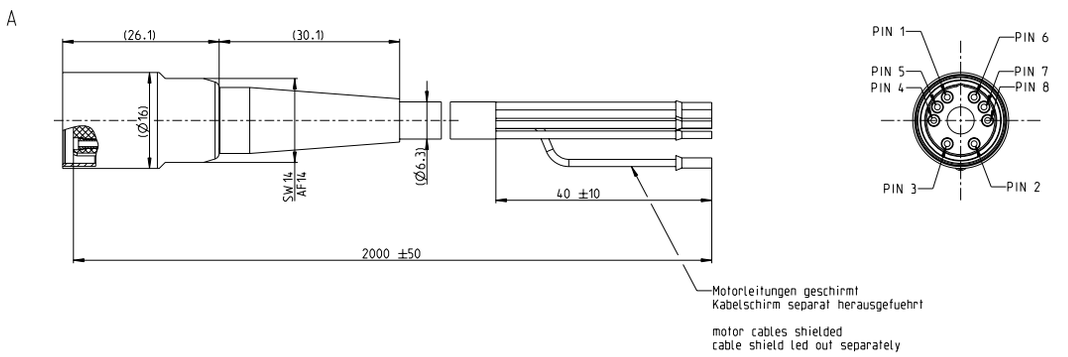
ECX 13 connecting cable

ECX 13 connecting cable
The connecting cable fits ECX 13 that are configured with a pin and external thread. Details about the motor can be found on pages 177–184 and online at www.maxonmotor.com.

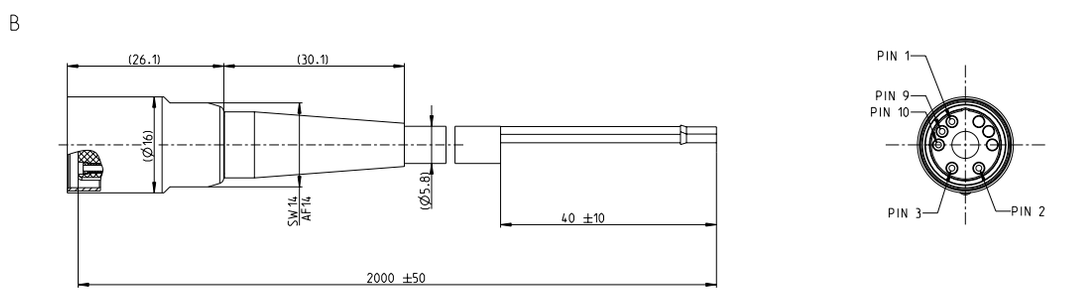
Characteristics:
- Steel housing
- Withstands 1000 sterilization cycles in the autoclave
- Silicone outer shell
- PTFE cable insulation
- Electrical conductors with cable end sleeves
- A motor cables shielded. The shielding is fitted with heat shrink tubing and cable end sleeve.

Part number	Cable version
585750	ECX 13 connecting cable, type **A:** for motors with Hall sensors or for versions with encoders
592191	ECX 13 connecting cable, type **B:** for motors without Hall sensors and without encoders
595698	ECX 13 connector set (without cable)

A



B



Cable and pin assignment, type A

	Color	Pin
AWG 22	red	1
	black	2
	white	3
AWG 26	orange	4
	blue	5
	yellow	6
	brown	7
	green	8
	pink	no pin
	purple	no pin
	green	no pin

Cable and pin assignment, type B

	Color	Pin
AWG 22	red	1
	black	2
	white	3
AWG 26	pink	9
	purple	10

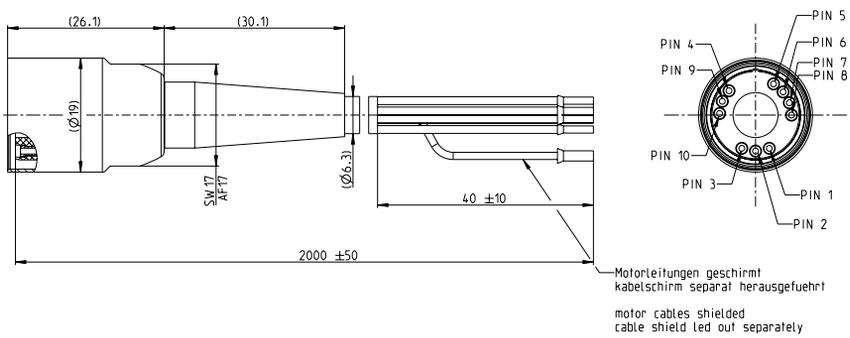
ECX 16 connecting cable

ECX 16 connecting cable
The connecting cable fits ECX 13 that are configured with a pin and external thread. Details about the motor can be found on pages 185–192 and online at www.maxonmotor.com.

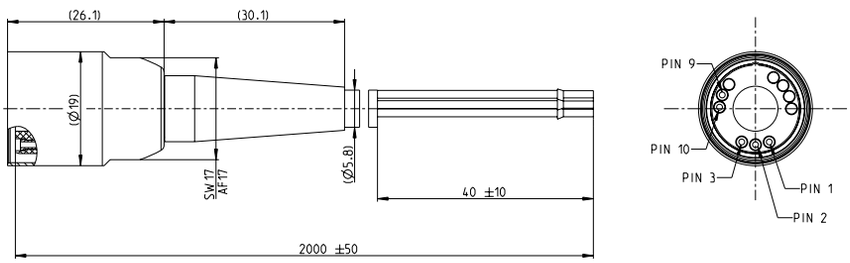
Characteristics:
- Steel housing
- Withstands 1000 sterilization cycles in the autoclave
- Silicone outer shell
- PTFE cable insulation
- Electrical conductors with cable end sleeves
- A motor cables shielded. The shielding is fitted with heat shrink tubing and cable end sleeve.

Part number	Cable version
584532	ECX 16 connecting cable, type **A:** for motors with Hall sensors or for versions with encoders
592194	ECX 16 connecting cable, type **B:** for motors without Hall sensors and without encoders
595697	ECX 16 connector set (without cable)

A



B



Cable and pin assignment, type A

	Color	Pin
AWG 22	red	1
	black	2
	white	3
AWG 26	orange	4
	blue	5
	yellow	6
	brown	7
	green	8
	pink	9
	purple	10
	green	no pin

Cable and pin assignment, type B

	Color	Pin
AWG 22	red	1
	black	2
	white	3
AWG 26	pink	9
	purple	10

ECX 19 connecting cable

ECX 19 connecting cable

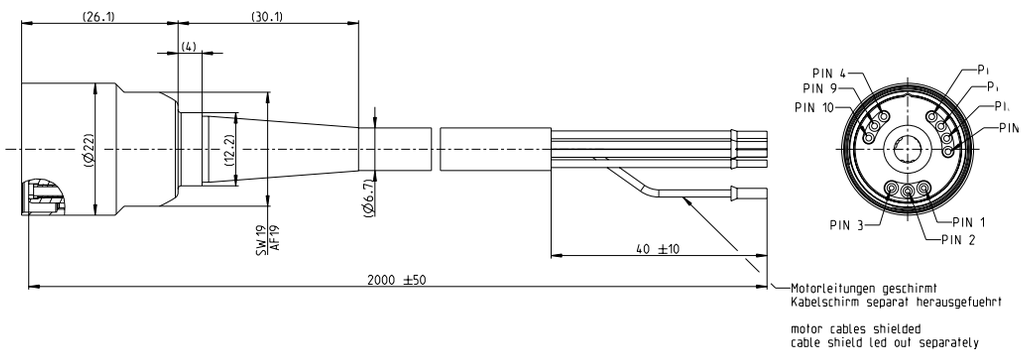
The connecting cable fits ECX 13 that are configured with a pin and external thread. Details about the motor can be found on pages 193–200 and online at www.maxonmotor.com.

Characteristics:

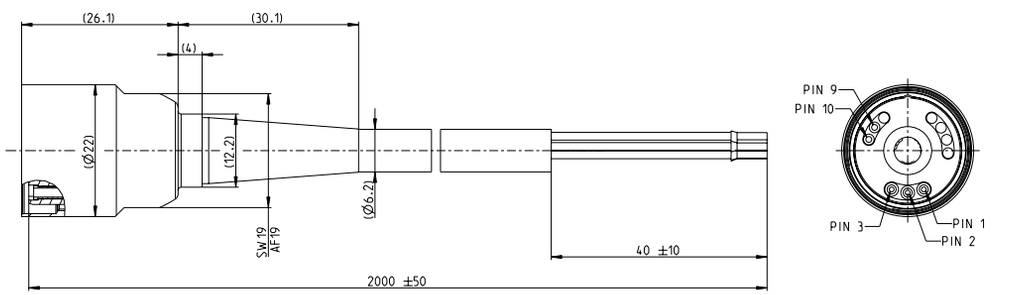
- Steel housing
- Withstands 1000 sterilization cycles in the autoclave
- Silicone outer shell
- PTFE cable insulation
- Electrical conductors with cable end sleeves
- A motor cables shielded. The shielding is fitted with heat shrink tubing and cable end sleeve.

Part number	Cable version
589852	ECX 19 connecting cable, type **A:** for motors with Hall sensors or for versions with encoders
589892	ECX 19 connecting cable, type **B:** for motors without Hall sensors and without encoders
551012	ECX 19 connector set (without cable)

A



B



Cable and pin assignment, type A		
	Color	Pin
AWG 20	red	1
	black	2
	white	3
AWG 26	orange	4
	blue	5
	yellow	6
	brown	7
	green	8
	pink	9
	purple	10
	green	no pin

Cable and pin assignment, type B		
	Color	Pin
AWG 20	red	1
	black	2
	white	3
AWG 26	pink	9
	purple	10

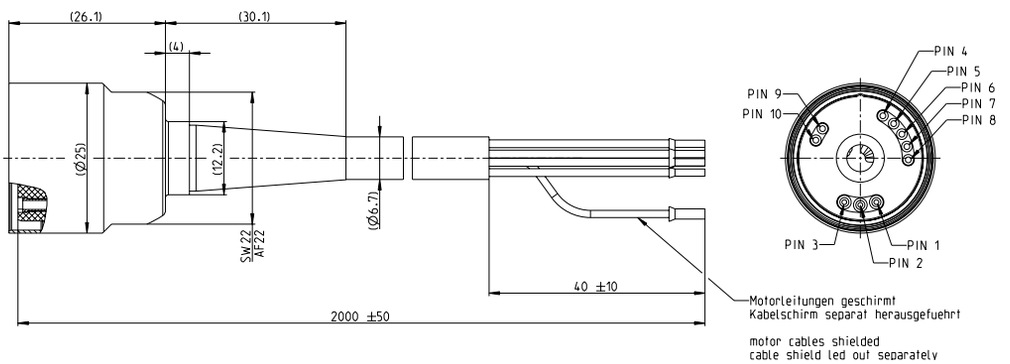
ECX 22 connecting cable

ECX 22 connecting cable
The connecting cable fits ECX 13 that are configured with a pin and external thread. Details about the motor can be found on pages 201–208 und online auf www.maxonmotor.com.

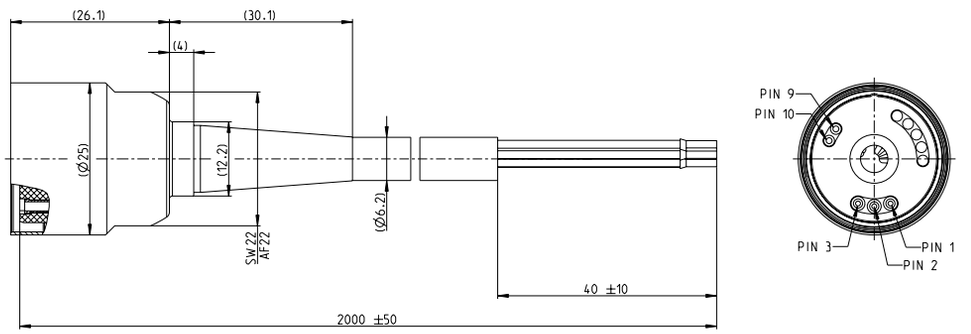
Characteristics:
- Steel housing
- Withstands 1000 sterilization cycles in the autoclave
- Silicone outer shell
- PTFE cable insulation
- Electrical conductors with cable end sleeves
- A motor cables shielded. The shielding is fitted with heat shrink tubing and cable end sleeve.

Part number	Cable version
574625	ECX 22 connecting cable, type **A:** for motors with Hall sensors or for versions with encoders
592061	ECX 22 connecting cable, type **B:** for motors without Hall sensors and without encoders
595696	ECX 22 connector set (without cable)

A



B



Cable and pin assignment, type A

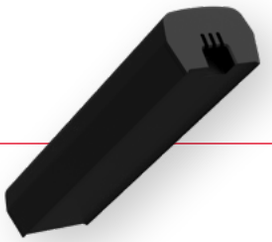
	Color	Pin
AWG 20	red	1
	black	2
	white	3
AWG 26	orange	4
	blue	5
	yellow	6
	brown	7
	green	8
	pink	9
	purple	10
	green	no pin

Cable and pin assignment, type B

	Color	Pin
AWG 20	red	1
	black	2
	white	3
AWG 26	pink	9
	purple	10

Batteries and battery management system (BMS)

maxon BMS



maxon
Lithium-ion batteries

Integrated battery solutions for your application
maxon battery systems based on lithium-ion cells are individually tailored to your requirements and integrated seamlessly into your application. Alongside the battery cells, battery management is a key component in your solution. maxon has its own modular solution for this.

Please note: The battery management system can only be purchased as part of a battery!

Data

BMS 13-02

BMS 14-01

maxon Battery Management System (BMS)		
Cell configuration	13 s (Range 9 s - 15 s)*	14 s
Battery types	LiIon**	LiIon**
Max. Capacity	32 Ah	32 Ah
Communication		
Bus interface	CANopen (CiA 301, CiA 418) A	CANopen (CiA 301, CiA 418)
Electrical data		
Nominal voltage	46.8 V	50.4 V
Charging Voltage	54.6 V	58.8 V
Final discharge voltage	36.4 V	39.2 V
Nominal continuous charge/discharge current	15 A	15 A
Pulse charge/discharge current 30 s	30 A	30 A
Pulse charge/discharge current 100 ms	100 A	100 A
Pulse charge/discharge current 100 µs	150 A	150 A
Protection functions		
Over voltage	ok ✓	ok ✓
Under voltage	ok ✓	ok ✓
Over current protection	ok ✓	ok ✓
Short circuit protection	ok ✓	ok ✓
Advanced Control Capabilities		
Temperature Management	ok ✓	ok ✓
Cell Balancing	ok ✓	ok ✓
Advanced battery gas gauging	ok ✓	ok ✓
Mechanical Data		
Dimensions	123.5 x 63 mm	80 x 76 mm

*Population Variant of BMS
**Other types on request

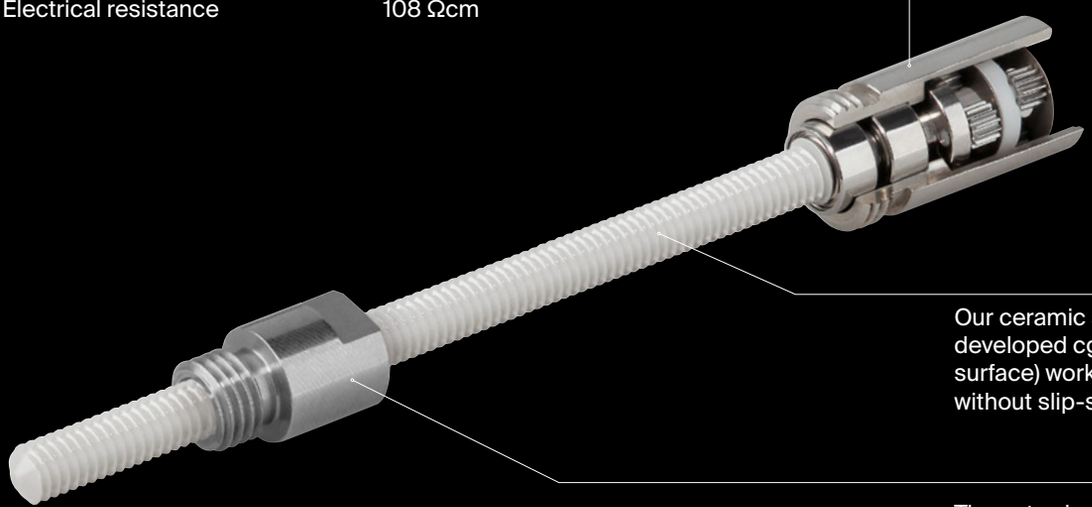
maxon ceramic

maxon ceramic

High performance industrial ceramic is used primarily for applications where customary materials would fail. maxon ceramic products include: precision screws, axles and shafts, customer-specific components for microtechnology, and scratchresistant housing components.

General material properties

Bending strength	>800 N/mm²
Elasticity modulus	2 x 105 N/mm²
Density	≥6,08 g/cm³
Hardness	1350 HV
Heat expansion coefficient	10 x 10-6 1/K
Thermal conductivity	2 W/mK
Electrical resistance	108 Ωcm



Polished ceramic surfaces are ideal for sliding movements.

Our ceramic spindles with specially developed cgs surface (ceramic glide surface) work almost completely without slip-stick effect.

The nuts also profit from the special maxon cgs surface and achieve significantly longer life spans. (new text)

→ Extremely high wear resistance and hardness

→ Excellent sliding characteristics

→ High mechanical strength

→ Long service life

→ High temperature resistance

A unique material

Ceramics are used where all other materials fail.

At the Sexau location in the southwest of Germany, maxon develops and manufactures customer-specific CIM (Ceramic Injection Molding) parts. Our development and engineering department has more than 20 years of experience in powder injection molding, use cutting-edge CAD technology and make use of the finite element calculation method. CIM enables maxon to manufacture highly complex ceramic molds - with unique precision and high quality.

ceramic.maxongroup.com

The benefits of ceramic as material

- → Extremely high wear resistance and hardness
- → Excellent sliding characteristics
- → High mechanical strength
- → Long service life
- → High temperature resistance
- → Excellent insulation properties
- → High corrosion resistance and chemical stability
- → Biocompatible
- → Low specific weight

Our fields of application

Watch technology

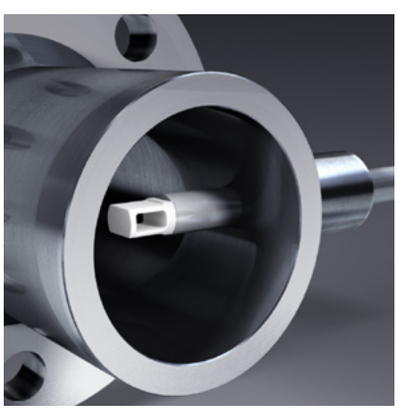
Components for mechanical clockwork

In clockwork, the tiny mechanical parts have to be machined with utmost precision for the clock to run reliably. With ceramic components, the meshing parts maintain precision over life spans never achieved before.

Ceramic components for automatic watches.

- Highest precision
- Unprecedented life spans
- High wear resistance
- Reliable series production
- Absolutely non-magnetic

Precise and long-lasting.

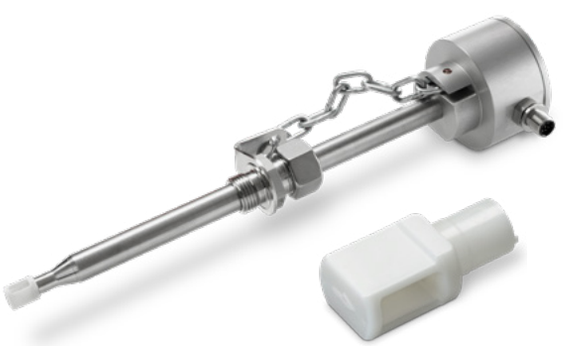


Measuring technology

Sensor housing for a flow meter

Ceramic resists harsh conditions. As a sensor housing, ceramic shows resistance against high temperatures, abrasive dust in the mass flow and chemically aggressive condensate. The low heat conductance protects the electronics inside of the sensor. This passive behavior toward electric and magnetic fields makes it possible to use electronic sensors.

- High resistance against external conditions
- Low heat conductance
- Passive behavior toward electric and magnetic fields
- Maintenance and follow-up costs are avoided
- Absolutely non-magnetic



Highly robust and resistant to extreme ambient conditions

Audio technology

Housing for high-tech in-ear headphones

Scratch-resistant ceramic for the headphone housing ensures a long service life and makes it comfortable to wear.

Ceramic surfaces feature scratch-resistance and shine. As a result of its low heat conductance, ceramic feels warm and pleasant. The continuous development of our polishing and shaping processes combines aesthetic design and functionality in a very special way. Ceramic housings protect the high-quality technical components inside and give the products a long-lasting high-quality exterior.

- → Perfect surface finish
- → Scratch resistance for a long service life
- → Low heat conductance for pleasant wearing
- → Optimal acoustic properties

Audio technology

Bearing for high-end record player

To get the perfect sound experience, there can be no compromises: All factors have to harmonize perfectly. Special challenges such as magnetic fields and precise radial run-out can be mastered easily by using ceramics. The demands in the high-end sector are extremely high: Highest precision and quality have utmost priority in the material selection, processing and surface finishing. Seamless cooperation based on trust is the perfect prerequisite for first-class high-end products.

A ceramic magnetic bearing provides optimal conditions for sampling the record's groove without any interference.

- → Absolutely non-magnetic
- → Perfect surface finish
- → High wear resistance

Industrial automation

Elements for industrial machines

Machine and system availability is of utmost importance in the industry. This is precisely where ceramic shines, featuring hardness, strength, wear resistance, and outstanding sliding characteristics. This is particularly true of maxon ceramic spindles with the ceramic glide surface (cgs). Sleeves, guides, axles, and shafts are other typical applications for ceramic. The chemically resistant, non-magnetic material can be used in applications where other materials reach their limits.

- → High wear resistance
- → High hardness
- → Excellent sliding characteristics
- → Extreme strength

Ceramic offers the hardness, strength, wear resistance and sliding characteristics that are sought after in industrial automation.

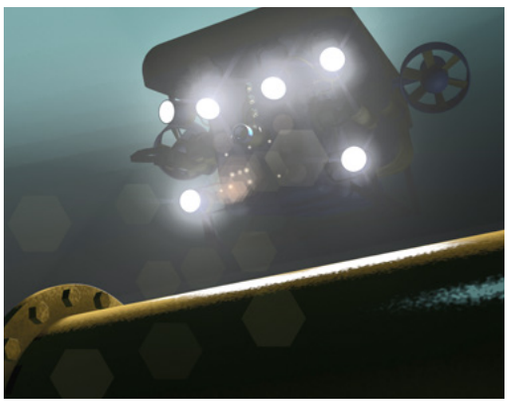
Medical

Insulation components for endoscopes

Medical technology places exceptionally high requirements on the materials used in the medical devices (e.g. endoscopes): Only excellent, visually perfect and reliable components are accepted. Additionally, the materials have to be biocompatible and resistant against body fluids.

- → Perfect surface finish
- → Biocompatibility
- → Low heat conductance
- → Extreme robustness

Ceramic insulation components are highly valued in endoscopic applications: They are biocompatible and robust.



Drive technology

Spindles for extreme conditions

Applications in salt water require robust and corrosion-resistant materials.

In drive technology, customary materials can reach their limits in some applications. For example, customized underwater drives require material that is resistant to salt water. Here our ceramic spindles shine: They are corrosion-resistant, robust, wear resistant and simultaneously offer high efficiency.

The maxon cgs (ceramic glide surface) ceramic spindles feature:

- Operation almost completely without slip-stick effect
- Smooth-running
- High hardness
- Extraordinary high service life
- High wear resistance
- High efficiency

Procedures and manufacturing process

A range of procedures for manufacturing high-quality ceramic products ensure top results.

CIM* process	Powder	Feedstock	Injection molding	Solvent debindering	Thermal debindering & sintering
Compression molding procedures	Powder		Compression molding		Sintering
Additive manufacturing	Powder	Suspension	LCM* process		Thermal debindering & sintering

*Ceramic injection molding
*Lithography-based ceramic manufacturing

Zirconia ZrO_2

Highly resistant to mechanical stress

Zirconia is a high-performance industrial ceramic. It is used primarily for applications where traditional materials would fail.

Special characteristics of zirconia:

- High wear resistance and hardness
- Excellent sliding characteristics
- High mechanical strength
- High temperature resistance
- Excellent insulation properties
- High corrosion resistance and chemical stability; largely acid and alkali resistant
- Elasticity modulus and heat expansion coefficient similar to steel
- Biocompatible and hypoallergenic
- Low specific weight

General material properties

Bending strength	>800 N/mm^2
Elasticity modulus	2 x 10^5 N/mm^2
Density	≥6.08 g/cm^3
Hardness	1350 HV
Heat expansion coefficient	10 x 10^{-6} 1/K
Thermal conductivity	2 W/ mK
Electrical resistance	10^{10} Ωcm

Aluminum oxide Al_2O_3

Highly resistant to thermal stress

Aluminum oxide is frequently used as insulation in electrical devices.

Special characteristics of aluminum oxide:

- High temperature resistance
- Good thermal conductivity
- Average mechanical strength
- Low coefficient of thermal expansion
- High corrosion resistance and chemical stability; largely acid and alkali resistant
- Good hardness
- Low specific weight

General material properties

Bending strength	>350 N/mm^2
Elasticity modulus	3.5 x 10^5 N/mm^2
Density	≥3.98 g/cm^3
Hardness	2000 HV
Heat expansion coefficient	≥5 x 10^{-6} 1/K
Thermal conductivity	25 W/ mK
Electrical resistance	10^{15} Ωcm

System-specific nuts.

The right nut for each application.

In combination with ceramic screws, nuts are available in steel, brass, bronze or plastic. For applications with very high demands to the life span, we use CVD-coated steel nuts. The nuts profit from the special maxon cgs surface of the screws, this results in significantly longer life spans than those offered by metal screws.
For backlash-free applications, we offer preloaded nuts. For applications with strong magnetic or electric fields, plastic nuts are preferred. In applications involving movements with little load, the nuts may be operated without the lubricant.

Individual solutions.

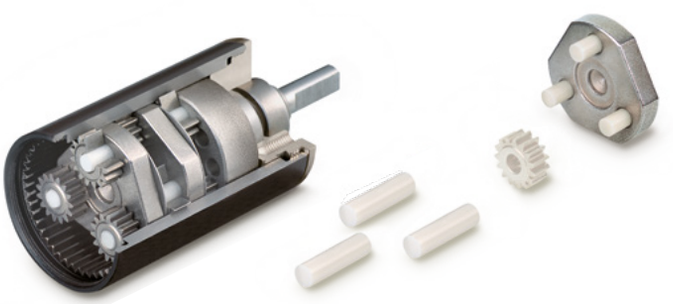
In addition to our standard program, we also offer screws and nuts tailored to your application needs. We provide screws with fine thread, special leads, as well as double-thread screws. A customer-specific integration with your bearing system is also possible. Please contact us if you are interested in learning more.

How can the life span of planetary gearheads be increased?

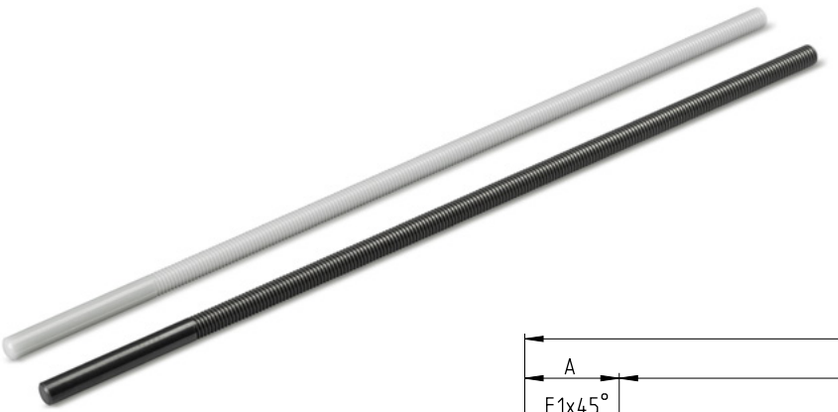
Planetary gearheads have existed for centuries; their simple structure makes it possible to transmit high torque in small spaces. To increase the life span, maxon motor increased the precision of the components and set new benchmarks for efficiency and life span by using a new material.

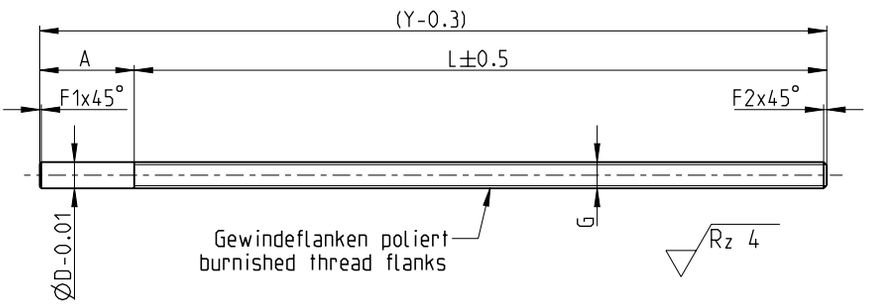
The use of ceramic axles in our gearheads led to a separate program for ceramic rods. Ceramic axles may be used in:

- → Linear guides
- → Positioning pins
- → Joints
- → Rollers



Ceramic standard components
Spindles

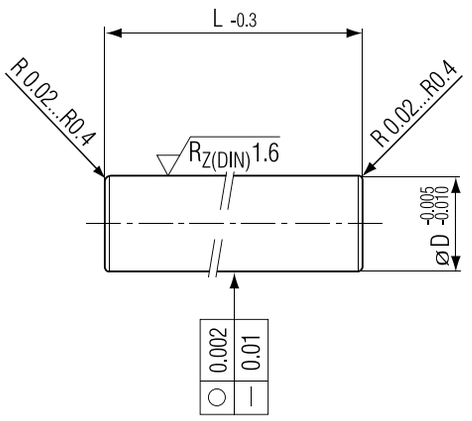


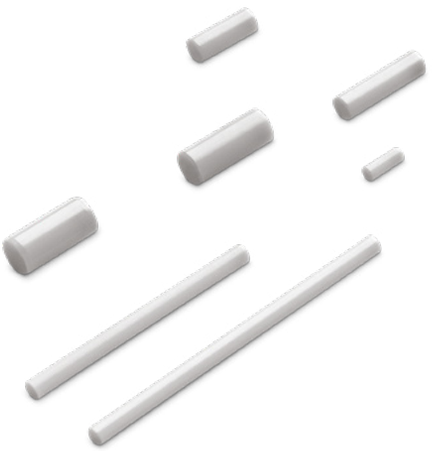


G	Color	Part No.	D	A max.	L max.	F1	F2	(Y) max.
M2	white	426634	2.0	18	102	0.3	0.3	120
M2.5	white	426707	2.5	18	132	0.3	0.3	150
M3	white	426715	3.0	18	132	0.4	0.4	150
M4	white	426717	4.0	18	132	0.5	0.5	150
M5	white	426730	5.0	18	132	0.6	0.6	150
M6	white	426740	6.0	18	232	0.7	0.7	250
M8	white	426763	8.0	18	232	0.8	0.8	250
M10	white	426783	10.0	18	232	1.0	1.0	250

Also available in black
Larger diameters and lengths upon request

Ceramic standard components
Axes





∅D	L = 2.4	L = 6.4	L = 7.4	L = 10.6	L = 13.8	L = 15	L = 35	L = 40	L = 60	L = 70	L = 120
0.8	255899	255900	255901	255902	255903	255904	255905[4]	348501[4]	348502[5]	348503[6]	
1.0	255891	255892	255893	255894	255895	255896	255898[4]	348498[4]	348499[5]	348500[6]	
1.5	255883	255884	255885	255886	255887	255888	255889[4]	255890[4]	255792[5]	255793[6]	
2.0	255872	255873	348693	255875	255876	255877	255879	255880	255881	255882	
2.5	255864	143825[3][7]	255866	255867	255868	255869	255870	255871	346621	348288	
3.0	255856	255857	255858	255859	255860	255861	255862	255863	346619	346620	
4.0	255845	255846	166875[1][3][7]	137962[1][3][7]	255849	255850	255851	255853	255854	255791	255787[5]
5.0	255833	255834	255835	255836	255837	255838	255839	255840	255841	255842	255843[5]
5.5	255818	255819	255820	255786	205063[2][3][7]	255825	255826	255827	255828	255830	255831[5]
6.0	255806	255807	255808	255809	255810	255811	255812	255813	255814	255815	255816[5]
8.0	255794	255795	255796	255797	255798	255799	255800	255801	255802	255803	255804[5]

[1] Diameter tolerance deviation: -0.008/-0.013
[2] Diameter tolerance deviation: -0.013/-0.018
[3] Rounded edges R 0.3 ± 0.1
[4] Straightness tolerance deviation: 0.02 mm
[5] Straightness tolerance deviation: 0.03 mm
[6] Straightness tolerance deviation: 0.04 mm
[7] Roundness tolerance deviation: 0.003 mm

For your personal notes

Electromate Inc.
6221 Highway 7
Unit #15
Vaughan, Ontario L4H 0K8
Canada
Phone: +1/877 737 8698
Fax: +1/877 737 8699
E-mail: sales@electromate.com
www.electromate.com

maxon Manufacturing Companies

Switzerland (Headquarters)	South Korea	USA
Germany	France	China
Hungary	Netherlands	Great Britain

maxon Sales Companies

Austria	Great Britain	Serbia
Australia	Hungary	Sweden
Benelux	India	Switzerland
Bulgaria	Ireland	Slovakia
China	Israel	Singapore
Croatia	Italy	Slovenia
Czech Republic	Japan	South Korea
Denmark	Norway	Spain
Finland	Poland	Taiwan
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maxon Sales Agents

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Sold & Serviced By:

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Toll Free Phone (877) SERVO98
www.electromate.com
sales@electromate.com